Candle Machinery.—Besides the machine last referred to, Messrs. Field exhibit a new patent machine for making the self-fitting ends. In the old method the caps that moulded the conical-butts are withdrawn simply by hand, and replaced in the same manner, entailing a great deal of labour and sacrificing a considerable quantity of wick. In Field's machine a lever separates the coned moulds, thus allowing the candle to be wound out in the ordinary way. The time taken in liberating one set of candles and filling another is five minutes, in the old machine from twenty to thirty.

Soaps.—From the oleic acid obtained from the autoclave and saponification processes, J. C. & J. Field manufacture a brand of soap known as the "Pure Oil Soap," much used by dyers, etc. Their speciality in toilet soaps is the newly-patented "Samphire Soap," which is saponified by the use of iodised potash obtained from the ashes of seaweed, and palm and olein oils. The resulting soap is subsequently milled, after completely expelling every trace of water, and is de-alkalised by the introduction of salicylate of ammonium.

Journal and Patent Literature.

I.—GENERAL PLANT, APPARATUS, AND MACHINERY.

An Improved Substance for Lining or Covering Steam Boilers, Pipes, and other objects. H. J. Allison, London. From Messrs. Sophus, Dohlmann & Company, Copenhagen, Denmark. Eng. Pat. 4343, April 8, 1885.

SAWDUST, chopped straw, cork, bark or other similar light substances are mixed with soluble glass and chalk or lime, in a pulverised state. The mixture thus obtained—formed into pieces adapted to the article it is intended to cover—is thoroughly impregnated with a boiling solution of calcium, magnesium or barium chloride or sulphate of alumina, and after washing in boiling water to free it from soluble salts, the substance, which is now incombustible, is ready for use.—A. W.

Improvements in Filters. E. M. Knight, Liverpool. Eng. Pat. 12,287, September 11, 1884.

A CYLINDRICAL vessel is formed with a concentric perforated cone ; this is covered with asbestos cloth, and the annular space filled with charcoal, held down by a perforated cover, through which the water to be purified is admitted to the charcoal filtering bed. The whole is suspended in a porcelain vessel of the usual shape.—C. C. H.

Improvements in Filters. P. A. Maignen, London. Eng. Pat. 13,345, October 8, 1884.

THE conical or V-shaped filtering frames, such as hitherto used by the patentee, are made so that the lower part forms a wedge joint with the side of the vessel in which they are placed.—C. C. H.

Improvements in Filters. C. E. Gittins, London. Eng. Pat. 14,019, October 22, 1884.

THE filter consists of a series of chambers formed from perforated plates and distance frames. These are arranged alternately as supply and discharge chambers, communicating with closed inlet and outlet conduits, as in a filter press. The plates are covered with asbestos or other cloth, and the interior of the chambers filled with charcoal. The whole apparatus is provided with a nozzle, so as to be attached to the tap of a water supply.

—C. C. H.

II.—FUEL, GAS, AND LIGHT.

The Influence of Water on the Combustion of Carbon Monoxide, and the Occurrence of Hydrogen Peroxide in this Combustion. M. Traube. Ber. **18**, 1890.

DIXON has shown (*B. A. Rep.* 1880, 503 ; *Chem. News*, 46, 151 ; *Phil Trans.* 1884, 617) that a perfectly dry mixture of carbon monoxide and oxygen cannot be caused to explode either by incandescent platinum wires, or the continued passage of sparks from a Ruhmkorff's coil. The author has found, in confirmation of this result, that carbon monoxide already burning, is extinguished in a dry atmosphere. The author considers the influence of the water to be represented by the following equations :

(1) $CO+2OHH+O_2=CO(OH)_2+H_2O_2$
(2) $H_2O_2+CO=CO(OH)_2$
(3) $2CO(OH)_2=2CO_2+2H_2O$.

That hydrogen peroxide is produced in the combustion of carbon monoxide, is shown by bringing the flame of the gas into contact with water, and then showing the presence of the peroxide in the water by the usual tests.

—F. L. T.

The Production of Hydrogen Peroxide in the Combustion of Hydrogen. M. Traube. Ber. **18**, 1894.

THE author failed to prevent the explosion of mixtures of oxygen (or air) and hydrogen by the electric spark, by having the mixture as dry as he could possibly make it, thus confirming Dixon's results. He confirms Schuller (*Wiedem. Ann. Chem. Pharm.* (1882) 15, 289) that hydrogen peroxide is produced by burning hydrogen in air, and finds by allowing the burning jet to impinge on the surface of water, that 100cc. of water can take up as much as 290mgrm. of the peroxide of hydrogen, figures indicating what seems to be the maximum concentration obtainable. The greatest amount of hydrogen peroxide produced from the combustion of 1 litre of hydrogen, was 0·0113grm. The size and shape of the jet at which the gas was burnt, the pressure, and the amount of air or oxygen, if any, mixed with the gas before burning, all exerted a perceptible influence on the amount of hydrogen peroxide produced.—F. L. T.

Influence of some Metals on a Mixture of Acetylene and Air. F. Bellamy. Compt. Rend. **100**, 1460—1461.

THE gases are mixed in a glass apparatus resembling a Bunsen's burner. If a platinum or silver wire, scarcely red-hot, be held in the mixture, it causes a detonation, but becomes only seldom, and then transiently and partially, white-hot; on the other hand a red glowing copper wire becomes, in a few seconds, white-hot, and then generally produces an explosion. Iron gives rise to the same phenomena, but with greater difficulty.

—F. L. T.

Combustion in Dried Gases. H. B. Baker. J. Chem. Soc. 1885, 349.

As H. B. Dixon has shown (*Chem. News*, **46**, 151 ; and *Phil. Trans.* 1884, 617) that a dry mixture of oxygen and carbon monoxide cannot be caused to explode by the electric spark, the author has investigated whether moisture is necessary in the combustion of the elements. Amorphous phosphorus, that had been washed with water and dried in a current of carbon dioxide at 100°, and afterwards in a vacuum at 150°, or wood charcoal that had been heated to bright redness in a current of chlorine, were sealed up with oxygen in difficultly-fusible glass tubes, some of which were slightly bent, and held phosphorus pentoxide in one limb. After about a week the phosphorus and charcoal were heated, but no ignition took place, whilst the same substances placed in similar tubes with moist oxygen, burnt as usual. Similar experiments with charcoal, in which the tubes were raised to redness, showed that, in the dry tubes, about half the oxygen remained uncombined ; whereas, in the moist tubes, no trace of free oxygen was present. In the dry tubes visible combustion never occurred. These experiments, and some others where the charcoal was submitted to the electric spark, show that the absence of moisture greatly retards the combustion of carbon in oxygen.—F. L. T.

Improvements in Machinery for Desiccating Coal and other Substances at Low Temperatures. H. G. Fairburn, Cardiff. Eng. Pat. 14,199, January 31, 1885.

THE material to be dried is placed on the floor of a closed chamber, practically exhausted of air, and to which a low external heat is applied. It is caused to move forwards over this floor by the action of a series of loose pendulous prongs, free to move in one direction only, and suspended from a frame, to which a slow reciprocating motion is communicated.—A. R. D.

Improvements in, or in Connection with, Apparatus for the Carburation of Gas in Railway and other Carriage Lamps and Lanterns. Peter Jensen, London. From J. E. Dery, Brussels. Eng. Pat. 8816, July 21, 1885.

THESE improvements are upon the apparatus referred to in Specification 10,675, July 28, 1884. Pipes are so disposed and provided with taps that, by suitable manipulation of these latter, the burner may be supplied with gas that either has or has not passed through the carburettor, or with any required mixture of the two.—A. R. D.

Improvements in and Apparatus for the Manufacture of Coke. J. Jameson, Newcastle-on-Tyne. Eng. Pat. 14,551, July 31, 1885.

THESE improvements relate to such coke-ovens as the "Jameson," from which the evolved gases are collected and treated for by-products. The gas passages in the bottom of the retorts are partly formed of T iron. This prevents the openings from being injured by the rakes, or from being clogged up by the deposit of hardened oil and dust, which settles upon brick. To provide greater cooling power a vertical pipe is placed between the oven and the main, of half the dimensions of the oven exit. Each of these cooling pipes is provided with a water gauge and an adjustable orifice by which the flow of the gas may be regulated. An expansion bar or pyrometer arrangement may be used to regulate the passage of the gas in an inverse ratio to its heat.—A. R. D.

Improvements in Coke-Ovens or Retorts, and in Apparatus connected therewith. John McCulloch, Airdrie. Eng. Pat. 15,821, August 31, 1885.

THIS invention relates to further improvements in the apparatus described in Specification 4122, of 1884. It comprises improved means of exit for the gases from the retorts; combustion chambers or flues combined with furnaces to ensure the perfect combustion of the gaseous fuel used; apparatus for utilising the heat of the volatile products for heating the air; and improved means of quenching the coke. For further particulars, the Blue Book, and its drawings, must be consulted.—A. R. D.

Improvements in Machinery for Compressing and Solidifying Coal and other Substances. H. G. Fairburn, Cardiff. Eng. Pat. 616, September 2, 1885.

THE inventor claims "the equal solidification and perfect division of compressed blocks of coal by means of a movable moulding die, working with a reciprocating motion, in line and in conjunction with a retaining tube." For further particulars consult the Blue Book.—A. R. D.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, Etc.

Brominated Derivatives of Diphenyl, Tolylbenzene and Ditolyl. Thomas Carnelley and A. Thomson. J. Chem. Soc. 47, Trans. 586—593.

THE hydrocarbons used in the present investigation were obtained by passing the mixed vapours of benzene and toluene through a red-hot tube (*J. Chem. Soc.* 37, 701).

1. The diphenyl, $C_6H_5.C_6H_5$, after crystallisation from alcohol, melted at 70° and boiled at 245° to 258°

2. The 1:4 tolylbenzene, $C_6H_5.C_6H_4.CH_3$, was a colourless liquid, boiling at 263° to 268°, and on oxidation gave first 1:4 phenylbenzoic acid, melting at 216° to 220°, and finally terephthalic acid.

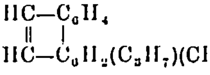
3. The 1:2:1′:4′ ditolyl, $CH_3.C_6H_4.C_6H_4.CH_3$, was a liquid, boiling at 272° to 280°, and on oxidation gave first 1:2:1′:4′ tolylbenzoic acid, $CH_3.C_6H_4.C_6H_4.COOH$, melting at 179° to 180°, and finally terephthalic acid.

Derivatives of Tolylbenzene.—Monobromo 1:4 tolylbenzene, $C_{13}H_{11}Br$, was prepared by brominating the hydrocarbon (boiling point 163° to 267°) obtained by the action of sodium on mixed monobromobenzene and 1:4 monobromotoluene. The compound melts at 131°, crystallises from alcohol in small pearly plates, and is readily soluble in benzene. *Dibromotolylbenzene*, $C_{12}H_7Br_2.CH_3$. Two isomeric modifications were obtained by the action of bromine on 1:4 tolylbenzene. By the oxidation of the mixed dibromo 1:4 tolylbenzenes, two *dibromophenylbenzoic acids*, $C_{12}H_7Br_2.COOH$, were obtained (melting point 202° and 232° respectively). *Monobromoditolyl*, $C_6H_4Me.C_6H_3BrMe = 1:2:1':(2' \text{ or } 3'):4'$, was obtained by the action of bromine on 1:2:1′:4′ ditolyl. The product was dissolved in a large quantity of alcohol, from which, on cooling, a brown oil separated, followed by a large crop of crystals. The latter were separated from the oil, and were recrystallised from alcohol. Fine interlacing microscopic needles melting at 93° to 95° were obtained, yielding, on oxidation with chromic and glacial acetic acids, an acid melting at 304° to 309° The oil referred to above was thoroughly dried and analysed, giving numbers agreeing with the formula $C_{14}H_{13}Br$. On oxidation, *monobromodiphenic* and *monobromophthalic acids* were obtained, the former melting at 215° Corr., and the latter at 203° Corr. The constitution of these acids is represented as follows:—Monobromodiphenic acid, $C_6H_4(COOH).C_6H_3Br.COOH$, 1:4:1′:4′:2′; monobromophthalic acid, $C_6H_3Br(COOH)_2 = 4:2:1$.

Dibromoditolyl, $C_{14}H_{12}Br_2$, was obtained by treating ditolyl dissolved in carbon disulphide with the calculated quantity of bromine. This compound crystallises in beautiful long, almost hair-fine, needles of brilliant lustre, melting at 156°. On oxidation, two brominated compounds of different melting point and composition were obtained (melting points 201° and 170° respectively). —D. B.

Constitution of Retene. E. Bamberger and S. C. Hooker. Ber. **18**, 1750.

THAT the hydrocarbon retene is a methylisopropylphenanthrene, and has the constitution—



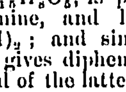
$$\begin{array}{l} HC-C_6H_4 \\ \;\|\quad\;\;| \\ HC-C_6H_2(C_3H_7)(CH_3), \end{array}$$

appears from the following considerations:—

1. It has previously been shown that retenequinone contains the double ketonic group CO—CO.

2. On oxidation with $KMnO_4$, retenequinone is converted into a monobasic acid, $C_{17}H_{14}O_4$, which, since it forms a compound with hydroxylamine, must contain a ketonic (CO) group, and hence has the formula $C_{15}H_{13}O(CO)CO_2H$; this ketonic CO group is probably derived by oxidation of the CO—CO group, as in the formation of diphenylene-ketone from phenanthrenequinone.

3. By further oxidation of the monobasic acid, $C_{15}H_{13}O(CO)CO_2H$, by means of $K_2Cr_2O_7$ and H_2SO_4, a dibasic acid, $C_{15}H_8O_5$, is produced; this also reacts with hydroxylamine, and hence has the formula $C_{12}H_6(CO)(CO_2H)_2$; and since, on dry distillation of the silver-salt, it gives diphenylene-ketone, it must be a dicarboxylic acid of the latter—

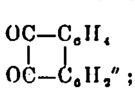


$$OC\begin{array}{l} \diagup C_6H_4 \\ \quad\;| \\ \diagdown C_6H_2(CO_2H)_2 \end{array}$$

4. That the dibasic acid, $C_{15}H_8O_5$, has this constitution, is also supported by the fact that on fusion with

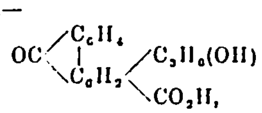
KOH it gives a diphenyltricarboxylic acid, and also that it is reduced by sodium-amalgam to a fluorenedicarboxylic acid.

5. From the above it follows that retenquinone must contain the skeleton



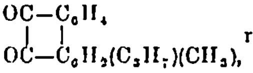
$$\begin{array}{l} OC-C_6H_4 \\ \;|\qquad\;| \\ OC-C_6H_2'' ; \end{array}$$

and on to this skeleton we have to put C_4 and H_{10}; this may either be attached in the form of two side-chains or as a ring. The latter constitution, however, is excluded by the formation of the monocarboxylic acid, $C_{17}H_{14}O_4$, by limited oxidation, whereas a ring would be sure to give rise to a dicarboxylic acid. The two side-chains may be either a propyl and a methyl group or two ethyl groups. Since the first oxidation product, $C_{15}H_{13}O(CO)CO_2H$, contains only one C atom less than reteneqninone, the CO_2H group must have been formed by the oxidation of a CH_3 group, the additional atom of O being probably derived by conversion of the propyl group into an oxypropyl group. Hence this monobasic acid, $C_{17}H_{14}O_4$, is an oxyisopropyldiphenyleneketonecarboxylic acid—



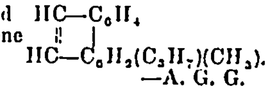
$$OC\begin{array}{l} \diagup C_6H_4 \\ \quad\;| \\ \diagdown C_6H_2 \end{array}\!\!\begin{array}{l} \diagup C_3H_6(OH) \\ \\ \diagdown CO_2H, \end{array}$$

and the retenequinone is methylisopropylphenanthraquinone. That the two side-chains are present in the same benzene nucleus is shown by the fact that the diphenyleneketonedicarboxylic acid produced by the oxidation gives a colouring matter allied to fluorescein on heating with resorcinol, and hence contains its CO_2H groups in the ortho position to each other. Hence retenequinone has the constitution—



$$\begin{array}{l} OC-C_6H_4 \\ \;|\qquad\;| \\ OC-C_6H_2(C_3H_7)(CH_3), \end{array}$$

and retene



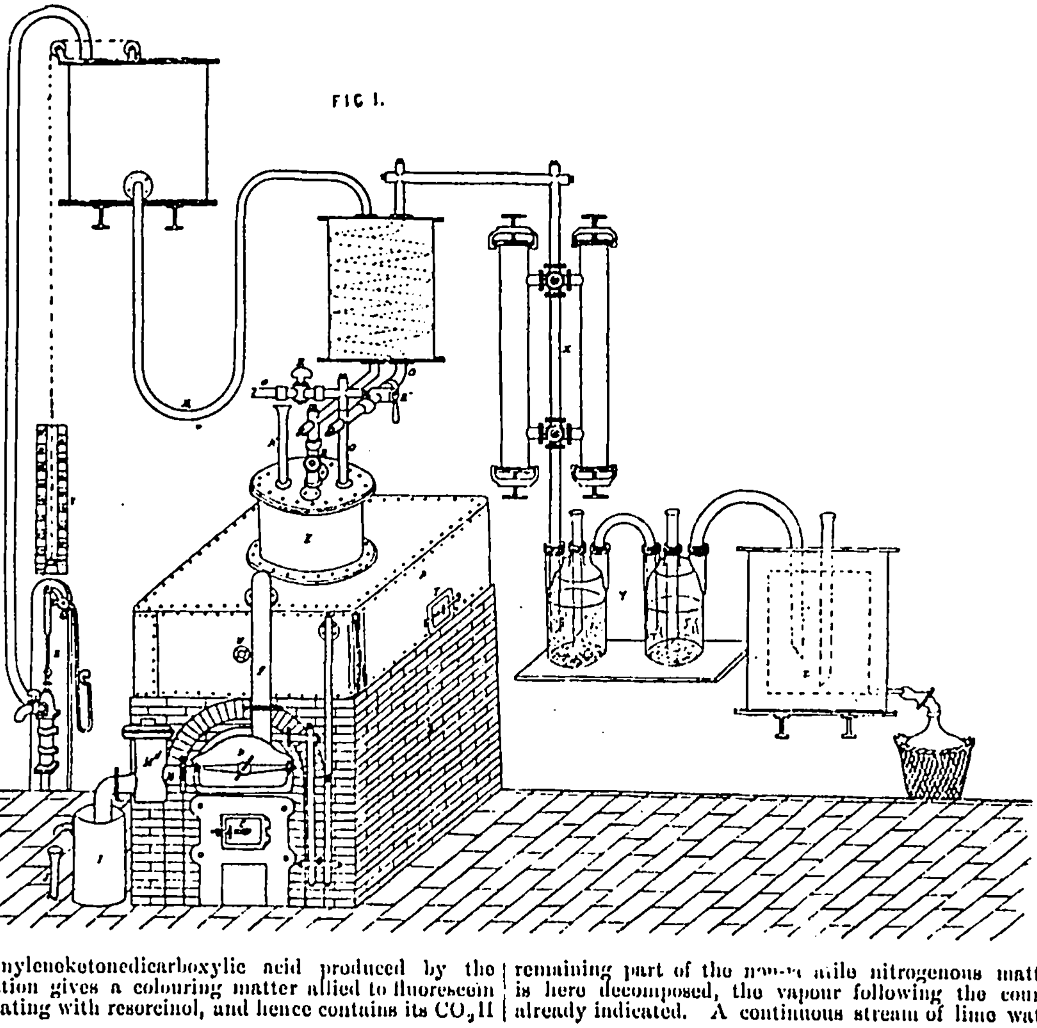
$$\begin{array}{l} HC-C_6H_4 \\ \;\|\qquad\;| \\ HC-C_6H_2(C_3H_7)(CH_3). \end{array}$$

—A. G. G.

Improvements relating to the Distillation of Substances containing Nitrogen, and Apparatus therefor. H. H. Lake, London. From C. Brison, Macon. Eng. Pat. 11,449, August 19, 1884.

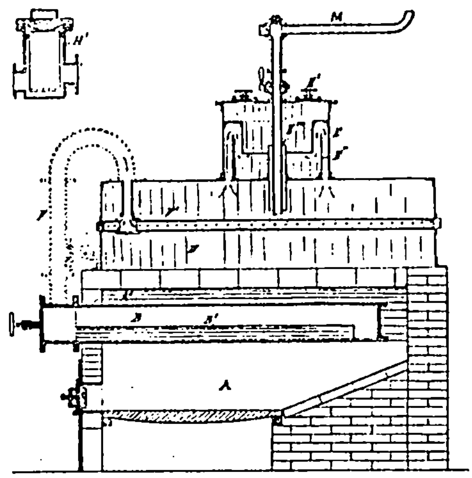
This specification describes an improved apparatus for the production of ammonia and ammonium salts from nitrogenous substances, and which will be understood from the annexed illustration. A (Fig. 2) is a furnace with a return flue A^1 round the retort B, which has a diaphragm B^1, causing its contents to circulate twice the entire length. Above is a heater B, connected to A by two tubes, one of which is F, connected with the perforated tube F^1. M is the feed tube from an overhead supply vessel. The heater is filled with the liquid under treatment, which overflows into the retort B. The volatile ammonia is driven off from the liquid in B, and passing through F^1 is condensed for a time in the liquid in B, but as soon as the temperature is high enough it is again given off and led away to a condensing vessel. The flow of liquor is regulated so as to be continuous, and in passing from the retort is led through a vessel containing lime, and sealing the interior of the retort from the air by means of a hydraulic seal. The remaining part of the non-volatile nitrogenous matter is here decomposed, the vapour following the course already indicated. A continuous stream of lime water

FIG. 1.



may also be added through the dome E, being held in E″, and overflowing through an annular tube E‴. In this case the gaseous ammonia escaping from the heater is constrained to pass in the direction of the arrows, through the milk of lime in E³ before leaving the apparatus. The patentee claims (1) the apparatus described, (2) the continuous treatment of nitrogenous liquids by such apparatus.—C. C. H.

FIG 3. FIG 2.



Constitution of Thiophen. J. Thomsen. Ber. 18, 1832.

About five years ago the author, from his thermochemical researches on the theory of benzene, arrived at the conclusion that the six carbon atoms are combined together by nine single bonds (*Ber.* 13, 1808). Further investigations on aromatic compounds, such as toluene mesitylene, aniline, anisoïl, phenol and phenyl chloride, fully confirm the constitution of benzene, as deduced from the determination of the heat of combustion. Similar investigations on the heat of combustion of thiophen also point to the conclusion that this substance contains no double bonds, the four carbon atoms being combined together by five single bonds.—D. B.

Synthesis of Benzene Derivatives from Potassium Carboxide. Nietzki and Benckiser. Ber. 18, 1833.

The authors have obtained Gmelin's croconic acid, $C_6H_2O_6$, from quinone derivatives. In repeating Lerch's experiments on the preparation of trihydrocarboxylic acid, dihydrocarboxylic acid and carboxylic acid from potassium carboxide hexhydroxybenzene, tetrahydroxyquinone and dihydroxydiquinoylbenzene were obtained. The authors conclude that these compounds are identical with the bodies described by Lerch. They have also established the identity of Will's rhodizonic acid with their dihydroxydiquinoyl.—D. B.

Presence of Paraxylene in Galician Petroleum.
B. Pawlowski. Ber. 18, 1915.

The author has isolated paraxylene from Galician petroleum (from Kleczany). He found that the crude oil contained about 2 per cent. of aromatic hydrocarbons, consisting mainly of benzene and paraxylene. The presence of the latter was detected by brominating the fraction distilling between 125° and 145°. Crystals of paraxylene bromide, $C_6H_4(CH_2Br)_2 = 1:4$, were obtained melting at 145°. This is said to be the first time that paraxylene has been detected in petroleum.
—D. B.

Improvements in the Distillation of Coal-Tar and other Hydrocarbon Substances, and in the Apparatus employed therein. H. W. Fenner, Blackheath. Eng. Pat. 13,629, October 15, 1884.

This invention consists in the application of stirrers as well as steam for the distillation of coal tar, the object being to effect the distillation with greater economy and rapidity, prevent destruction of the stills and save fuel. The still is provided with a hollow shaft which forms a channel down the centre for the supply of steam, and carries branch pipes for distributing the same. This central pipe, with its branches, is made to rotate by means of suitable gearing.—D. B.

An Improved Method of Heating Substances for the Purpose of Distillation. B. Walker, Birmingham. Eng. Pat. 13,650, October 16, 1885.

Distillation is effected by passing through the substance operated upon, a current of heated gas or vapour, which will not injure the distillate, or preferably it may be a portion of the vapour given off by the substance treated.—C. C. H.

IV.—COLOURING MATTERS AND DYES.

The Technology of Mineral Colours. Carl Otto Weber. Chem. Techn. Central. Anzeiger.

Chromium Colours.

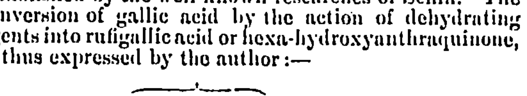
The most important is chrome yellow, which is also the basis of chrome yellow green, cinnabar green and other similar colours. The preparation of chrome yellow presents difficulties in practice, because products differing in shade and structure, although of uniform chemical composition, are obtained according to modifications of the method of manufacture or nature of materials employed. A special difficulty is the turning of colour, by which a "turned" yellow has a dirty orange-yellow colour, which when mixed with barytes gives a yellowish-brown, leather-coloured shade and not a light pure yellow, and other derived colours are similarly affected. The acetate and nitrate of lead are the soluble lead salts generally used. Basic carbonate of lead (white lead) is also much used, the yellows prepared from this material being cheaper, having a large covering capacity and are particularly adapted for ordinary greens; but these have not the smoothness and lightness so much prized in some of the yellows obtained from soluble lead salts. The oxide, sulphate, and chloride of lead have been proposed for the manufacture of chrome yellow, but their treatment would be very tedious and the products obtained only of medium quality. In the manufacture of chrome yellow from acetate of lead and bichromate of potash, different proportions of these materials are given by different authorities, but some of these are obviously wrong where an excess of bichromate is to be used, for every light chrome yellow is liable to turn by the action of chromic acid or a chromate and thereby become of little value. Proportions should be used, whereby the acetate of lead remains in excess, and the reaction should take place in a solution as cold and dilute as possible. In this way a brilliant yellow tint is obtained. For the lighter chrome yellows, lead sulphate is precipitated simultaneously with the chromate by adding sulphuric acid or a soluble sulphate to the solution of the bichromate; these yellows have less tendency to change colour than the pure chromate of lead, if the above precautions are observed. Chrome yellow, precipitated from an excess of a lead acetate solution, by means of potassium bichromate, corresponds to the formula $PbCrO_4$. When dried it forms light pieces, which show a conchoidal fracture. A still more voluminous product corresponds to the formula $PbCrO_4$, $Pb.SO_4$. The yellow having the composition $PbCrO_4$, $2PbSO_4$, is very heavy and shows a smooth fracture. Lightness is often imparted to chrome yellow by the addition of magnesium carbonate. Nitrate of lead offers no advantages over the acetate and is generally more expensive to use. Free nitric acid is more objectionable than free acetic acid, because it may act as a solvent on chrome yellow and liberate free chromic acid, which is liable to "turn" the yellow. When using lead nitrate it is preferable to neutralise potassium bichromate with soda to avoid the presence of free nitric acid. The yellows mostly in demand are the inferior qualities, prepared by mixing pure chrome yellows with white mineral matters, generally barytes, gypsum and kaolin, usually stirred in with the bichromate solution before adding the lead salt. Barytes injures the colour least, but kaolin has the advantage that it does not increase the weight of the colour so much. Gypsum occupies an intermediate position, it is much more voluminous than barytes and does not injure the colour so much as kaolin, but it is generally used together with barytes. It is not advisable to use this combination, for the reason that the colour on drying forms very hard pieces, which offer difficulties in grinding. Gypsum too, from being more easily acted on by reagents than barytes or kaolin, tends to take part in the reaction by decomposing the potassium bichromate before the addition of the lead salt, and this is objectionable.—C. H. B.

The Tannins and Derivative Colouring Matters (Artificial). O. N. Witt. Chem. Ind. 1885, 100—105.

The tannins form a well-marked group of aromatic compounds which, *from the circumstances of their occurrence* in nature, are destined to attract much attention from those who pursue chemistry as a branch of natural history. The author, in this paper, traces the constitutional connections which have hitherto been established between these compounds and the artificial aromatic colouring matters, and the view he gives has, therefore, an additional technical interest, foreshadowing, moreover, an extended application of the tannins in the future to the production of such compounds. The older classification of the tannins on the basis of their reactions with iron salts has been re-enunciated by Watts as the exact correlative of the constitutional relationship established by his researches—*i.e.*, the tannins giving a green colouration with solutions of the iron salts are all derived from pyrocatechol; those giving a blue reaction are, on the other hand, derivatives of pyrogallol. The typical representatives of the former are the tannin acids of catechu and the oak bark; of the latter the tannin of oak galls; while in the kinoin of Malabar kino, which has been shown to be a guaiacol gallate, we have a representative of a group of intermediate compounds, constructed upon a mixed type.

The best-known tannin, or ordinary "tannic acid," is closely related to the trihydric phenol pyrogallol $C_6H_3(\overset{1,\,2,\,3}{OH})_3$ and more directly to gallic acid, $C_6H_2(\overset{1,\,2,\,3}{OH})_3\overset{(4)}{COOH}$. *Tannin, in solution, in contact with alkalis, absorbs* oxygen from the air, and is converted into tannoxylic acid, or into tannomelanic acid at the boiling temperature. Treated in acetic acid solution with nitroso-compounds, it yields colouring matters, with *nitrosodimethylaniline, e.g.*, a violet. By the action of certain acids it is converted into ellagic acid, a carboxyl derivative of a hexa-hydroxy-diphenyleneketone, $C_6H(OH)_3 : CO : C_6(OH)_3(COOH)$. The constitution of this body, together with its characteristic colour reactions, indicate its probable wide application to the synthetic production of colouring matters, so soon as it can be made commercially available.

The relationship of tannin to gallic acid has been established by the well-known researches of Schiff. The conversion of gallic acid by the action of dehydrating agents into rufigallic acid or hexa-hydroxyanthraquinone, is thus expressed by the author:—



$$C_6H(OH)_3\Big\langle{\overbrace{H \quad\quad\quad\quad\; OH}^{}.CO \atop \underbrace{COOH \; + \; H}_{}}\Big\rangle C_6H(OH)_3-2H_2O$$

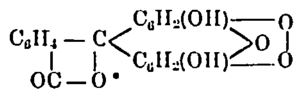
$$=(OH)_3.HC_6\Big\langle{CO \atop CO}\Big\rangle C_6H(OH)_3.$$

By the regulated action of sodium amalgam, Widmann has succeeded in converting rufigallic acid into alizarin, but the result remains for the present of purely theoretical interest. Gallic and benzoic acids treated together with concentrated sulphuric acid, are condensed to trihydroxyanthraquinone or anthragallol, a very serviceable colouring matter. *Gallic acid reacts with* nitroso-compounds to form colouring matters, which are the gallocyanins patented by H. Köchlin. These are fixed by means of chrome mordants. The following is an excellent formula for printing in these colours:—

75 gr. wheat starch,
½ litre gallocyanin paste,
⅜ ,, tragacanth,
⅛ ,, pyroligneous acid 7° B.,
⅛ ,, Turkey-red oil,

are boiled together, stirred till cold, and mixed with $\frac{1}{16}$ litre chromium *acetate* (20° B.) *and 30grm.* yellow prussiate. This mixture is printed and steamed in the usual way.

Pyrogallol, the phenol basis of these tannins, is technically interesting from its condensation, with phthalic anhydride, to the well-known colouring matter gallein. From the analogy of its formation, this body was supposed to be a dihydroxy-derivative of fluorescein until the researches of Buschka established for it the following constitutional formula:—



$$\begin{array}{l} \quad\quad\quad\quad\quad\; C_6H_2(OH)\!-\!\!-\!O \\ C_6H_4-C\Big\langle \quad\quad\quad\quad\quad\quad \Big\rangle O \;\; | \\ \;\;|\quad\quad\;| \quad\quad C_6H_2(OH)\!-\!\!-\!O \\ OC-O\,\cdot \end{array}$$

By dehydration with sulphuric acid, gallein is converted into cœrulein, $C_{20}H_8O_6$, *a derivative of* phenylanthracene, yielding this hydrocarbon on distillation with zinc dust. The following formula for preparing this colour for printing has been found to give excellent results:—600grms. of the commercial cœrulein (paste) are *mixed with* 320 grms. sodium bisulphite solution at 30° B., the mixture allowed to stand 3 hours, and then intimately mixed with 120grms. chrome acetate (10° B.) and 3kilos. thickening, previously incorporated together. The thickening is composed of the following:—80grms. wheat starch, 80grms. light gum, 400grms. tragacanth (jelly), 800grms. water, 200 olive oil. These are boiled for half-an-hour, stirred till cold, and the mixture strained.

The condensation products of pyrogallol with aldehydes, investigated by Baeyer, have not yet received any technical application. Another interesting derivative of pyrogallol is the nitro compound obtained by treating the phenol in ethereal solution with nitrous acid; this is converted by reduction into amidopyrogallol, which gives a blue colouring matter on treatment with solution of sodium hydrate. Pyrogallol treated with diazobenzene nitrate yields an orange-yellow colouring matter.

The colour reactions of the second group of tannins, derivatives of pyrocatechol, are, as so far established, much less numerous. The constitutional relationships of these derivatives are also much more difficult of investigation. The catechols are converted by oxidation with chromic acid into brown colouring matters. With nitroso-compounds they yield violet colouring matters, as do also machromin, the tannin and morin, the colouring matter obtained from *morus tinctoria*, and the tannin of the horse chestnut.—C. F. C.

Pentamethylamidobenzene. A. W. Hofmann. Ber. **18**, 1821.

The author gives the following method for the preparation of pentamethylamidobenzene:—2 parts of methyliodide are slowly added to 1 part of cumidine, and the reaction is completed on the water bath. *On the addition of* water, methyl- and dimethyl-cumidine dissolve, and also any unchanged cumidine in the form of hydriodides, and by adding alkali the bases separate out. The mixture boiling between 220° and 230° is again heated with an equal weight of methyliodide in a closed tube for 8 hours to 240—250°. The product, a dark-coloured crystalline mass, contains resins, hydrocarbons (chiefly hexamethylbenzene), and pentamethylamidobenzene, with other bases in the form of hydriodides. The mass is treated with steam, which drives off the hydrocarbons. It is then filtered and saturated with caustic soda to free the bases. A crystalline mass and an oily substance separate, the latter being dissolved by washing repeatedly with aqueous alcohol. The crystalline compound thus purified is redissolved in HCl and precipitated with caustic soda, when a solid base separates, which may be re-crystallised from alcohol. The ultimate analysis of the compound and that of the platinum salt correspond to the formula for pentamethylamidobenzene, $C_{11}H_{17}N$ or $C_6(CH_3)_5NH_2$M.pt. = 151° to 152° and b.pt. 277°—278°, the reaction taking place according to the following equation :—

$$C_6H_2(CH_3)_5N(CH_3)_2.HI = C_6(CH_3)_5NH_2.HI.$$

By the further action of methyliodide on pentamethylamidobenzene, the methylated amine may be prepared. The dimethylated compound, however, could not be obtained in this way. From this base the author has prepared the corresponding isonitrile by the action of chloroform, and also the nitrile, the latter being characterised by its stability in presence of mineral acids. By the action of KNO_2 on the amine, pentamethylphenol is obtained in white needles, and by heating the base with CS_2 the corresponding mustard oil and sulpho-urea may be prepared.—J. B. C.

Derivatives of Thiodiphenylamine. N. Fraenkel. Ber. **18**, 1843.

In a previous paper (*Ber.* **17**, 2857) it was shown that, by the introduction of one amido group into thiodiphenylamine, the leuco base of a dye is obtained. The author has continued his investigations and has prepared the following derivatives :—*Benzoylthiodiphenylamine* $C_6H_5—CO—N(C_6H_4)_2S$, obtained by heating thiodiphenylamine with an equivalent quantity of benzoyl chloride in a sealed tube at 100°. It crystallises from alcohol in the form of laminæ and from glacial acetic acid, benzene or petroleum spirit in flat needles melting at 167°. *Thiodiphenylurethane*, $S(C_6H_4)_2N—CO.OC_2H_5$, obtained by heating thiodiphenylamine with chloro-carbonic ether and ethyl alcohol to 100—120°. It crystallises in white silky laminæ melting at 109—110°. *Thiodiphenylcarbonylchloride*, $S(C_6H_4)_2N—CO.Cl$, prepared by heating thiodiphenylamine with an excess of carbonylchloride (dissolved in toluene) in a sealed tube at 100°. Crystallises in thick clusters of prisms or needles melting at 167·5°. *Dithiotetraphenylurea*, $CO(NC_{12}H_8S)_2$, obtained by heating thiodiphenylcarbonyl chloride with thiodiphenylamine (diluted with benzene) in sealed tubes to 200°. It crystallises in fine colourless laminæ melting at 223—225°. The author has studied also the action of concentrated sulphuric acid on thiodiphenylamine. A phenolic dye of the formula $C_{12}H_7NSO_2$ is obtained, called *thionol*. Its constitution appears to be

$$N(C_6H_3)_2SO(OH).$$

—D. B.

V.—TEXTILES : COTTON, WOOL, SILK, Etc.

Improved Process and Solution or Liquid for treating Textile and other Materials, whereby they may be rendered Waterproof. Alfred Julius Boult. From Otto Hiller. Eng. Pat. 14,725, November 7, 1884.

The solution is prepared by adding a solution of acetate of lead to one of sulphate of alumina in such proportion that a slight excess of sulphate of alumina remains in solution. The precipitate of sulphate of lead is removed by filtration, and to the solution of acetate of alumina, a solution of albumen is added and, if necessary, the liquid again filtered. The material to be rendered waterproof is saturated with this solution, dried and passed through hot rollers to coagulate the albumen. Certain precautions are necessary, such, for example, as the employment of pure chemicals.—E. J. B.

The Manufacture and Application of a Novel Product Impervious to Air and Water. Ernest de Pass. From Albert Lèbre. Eng. Pat. 15,075, November 15, 1884.

In working out a process for waterproofing fabrics, patented in 1883, November 5, No. 5242, it was discovered that a combination is effected between cotton or similar substances and the waterproofing material employed. The compound so formed has been called by the inventor "Hydrofuge Cotton." It has many useful industrial applications.—E. J. B.

Improvements in the Preparation and Utilisation of Peat Fibre for Textile Purposes. William Phillips Thompson. From George Henri Béraud. Eng. Pat. 15,877, December 3, 1884.

The preparation of the raw material is effected by scutching and carding the peat by machines similar to those used in the preparation of other fibres; the dark colour of the material may be got rid of by the use of bleaching agents in the usual way.—E. J. B.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Artificial Alizarin in Wool Dyeing. The St. Denis Dyes and Chemical Products Company. Chem. Zeit. 1885, 926, 927.

The artificial product dissolves in the bath just as the wool takes it up, so that the operation requires no more time than is needed by the dye as generally used. By merely changing the mordant and its relative amount a large number of shades can be produced. Thus with aluminium salts can be obtained shades from delicate rose to deep red; with chromium salts from light wine colour to dark chestnut-brown; with iron salts from light lilac to dark violet; with uranium salts from a greyish blue to dark slate; with nickel salts from greyish lilac to bluish garnet, with tin salts from rose to deep red, etc. Fustic and cœrulein dye with the same mordants and add to the number of colours which can be attained by the help of alizarin. Dyeing by means of alizarin is effected in two stages; first, the mordanting, and then the dyeing proper. The former is done at a boiling temperature and takes from 1—1½ hours. After being washed in running water the dyeing proper follows.

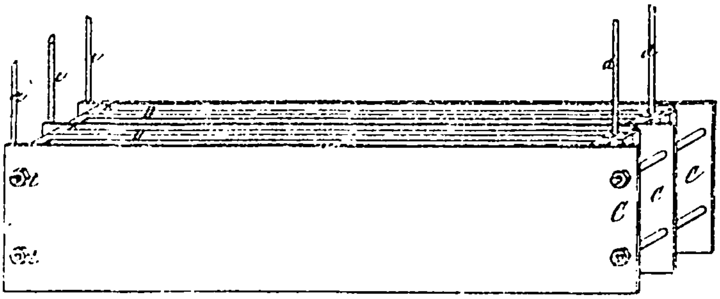
—J. T.

Improvements in Machinery for Printing in Colours. A. Grafton, London. Eng. Pat. 14,876, November 11, 1884.

The inventor describes with great fulness of mechanical detail a polychromatic printing machine which he has devised, "capable of printing on large surfaces and free from any irregularities of motion which would cause imperfect impressions."—J. H. H.

Improvements in Bleaching and Apparatus therefor. J. H. Johnson. From E. Hermite, Paris. Eng. Pat. 13,929, October 21, 1884.

This invention relates to an improved process and apparatus for bleaching yarn, textile fabrics, paper pulp, etc., by means of the electrolytic decomposition of magnesium or calcium chloride—preferably the former. The reactions which ensue when a solution of $MgCl_2$ is submitted to electrolysis are extremely complex, and the inventor gives several equations—though unfortunately he uses the old notation—showing that chlorates, chlorites and hypochlorites are formed and that the action is continuous, $MgCl_2$ being the final product. Hence the same solution can be used an indefinite number of times. A solution of $MgCl_2$ of sp. gr. 1·125 (25° T.) gives the best results; with $CaCl_2$ a sp. gr. of 1·191 (38° T.) is required. The inventor states that he has shown experimentally that, in order to bleach linen thread, the quantity of chlorine required is only about one-ninth of that required by the ordinary bleaching powder method. The negative electrodes consist of zinc plates bolted together and soldered to copper rods which are connected with the main conductors, and insulated by means of varnish from contact with the liquor. The positive electrodes are platinum plates sunk into wooden frames and similarly soldered to copper conducting rods. In the figure annexed C C are the zinc plates; D D the platinum plates, and *c c* and *d d* the copper conducting rods, while through the holes



t t pass the bolts joining the zinc plates. Various methods of applying the process to cotton goods, yarn and paper pulp are described; in the case of the last-mentioned the electrolysed solution must be run off as soon as the bleaching is completed. The specific resistance of a solution of $MgCl_2$ of sp. gr. 1·125 at 30° C. is 6·1 ohms, and the polarisation in open circuit 2·13 volts. The inventor claims that the most delicate textiles are not in the least injured by the use of his process of bleaching.—J. H. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Cause of Decrepitation in Samples of so-called Explosive Pyrites. B. Blount. J. Chem. Soc. August, 1885, 593.

The author found that these decrepitations were due to the presence of confined carbonic dioxide and water, but the CO_2 and H_2O did not occur in any definite ratio to each other, one sample being quite free from moisture. The particular pyrites examined was copper pyrites from the Cosheen Copper Mine on Scull Harbour, County Cork. —F. L. T.

Improvements in the Manufacture of Salt from Brine, and in Apparatus therefor. H. Whitehead and R. Hodgson, Sandbach. Eng. Pat. 14,533, Nov. 4, 1884.

This invention consists in a greatly improved system of evaporating, and in apparatus for carrying it into effect. The liquor to be boiled down is alternately heated to the boiling point and then allowed to cool, the crystals being meanwhile fished out. The cold mother-liquor is again heated, cooled, and so forth, until all is evaporated. In actual practice the process becomes continuous by dividing the pan into a series of troughs, communicating alternately at each end, sending the hot liquor in at one end and pumping the cool out at the other for reheating. The apparatus consists of two cylinders containing a series of pipes through which the brine is made to pass by means of a pump. The upper cylinder is supplied with steam from the boiler, the lower cylinder being heated by the exhaust steam of the pump. The brine in passing through the pipes becomes heated to its boiling point, then flows into a pan, where it cools down and deposits salt, and afterwards flows continually through an overflow into a tank, from which the pump passes it into the pipes and into the pan as before. The tank is automatically supplied with new brine. The salt is drawn from the pan by a mechanical scraper. As no heating of the pan is required, it can be built of cement, and consequently the wear and tear incident on heating brine-pans by firing below, is avoided.—S. H.

Improvements in the Manufacture of Alkaline Phosphates. P. M. Justice, London. From L. E. Thomas, Paris. Eng. Pat. 14,549, November 4, 1884.

An intimate mixture of an alkaline chloride and caustic alkali is exposed to the action of molten phosphoric iron in a converter, preferably having a basic (Thomas & Gilchrist) or neutral lining. Carbonate of soda or potash, or magnesia or oxide of iron are added to the mixture to diminish its volatility. At the end of the operation the slag will contain the phosphorus from the metal as an alkaline phosphate, more or less soluble in water. The slag may be subsequently fused with alkaline carbonate, hydrate or sulphate, to render the whole of the phosphoric acid soluble in water.—S. H.

Improvements in the Treatment of Sulphate of Iron. S. Callard, Carmarthen. Eng. Pat. 15,303, November 22, 1884.

This invention relates to improvements in the drying of sulphate of iron previous to its being placed in the muffle, as described in Letters Patent 5930, April 4, 1884, for "Improvements in the destructive distillation of sulphate of iron, and in the obtaining therefrom of sulphurous acid and red oxide of iron." For the purposes of this invention the sulphate of iron is heated in iron pans along with a certain amount of sulphuric acid, which prevents the formation of scale and brings the whole charge in a pulverised condition when dry.—S. H.

Improvements in Treating Salt, etc. A. Collingridge, London. From V. Cornet and A. Jones, Paris. Eng. Pat. 5706, May 9, 1885.

Unsuited for abstracting.—C. C. H.

Obtaining Liquid Anhydrous Sulphurous Acid from Furnace and other Gases. E. Haenisch and M. Schroeder, Oberhausen, Prussia. Eng. Pat. 6405, May 26, 1885.

The object of this invention is to obtain anhydrous sulphurous acid from gases containing only a small percentage of sulphur dioxide. The process may be divided into three distinct stages. 1. The production of watery sulphurous acid solutions by bringing furnace gases in contact with a stream of cold water. 2. The production of pure sulphur dioxide by heating the sulphurous acid solution. 3. The condensation of sulphur dioxide by compression or refrigeration. The gases from the roasting kiln pass through a pipe into an absorbing tower, charged with coke, where they are met by a copious spray of cold water. The solution thus formed flows into a series of closed pans, made of sheet lead, to which heat is applied. The sulphur dioxide evolved passes into a cooling worm, and then for removing the last traces of water into a vessel charged with pieces of calcium chloride, and thence to a compression pump. The water from the pans is deprived of the last traces of sulphurous acid by allowing it to pass through a tower filled with lead-wire network, where it meets steam at the bottom. The pressure within the apparatus is regulated by means of a taffeta bag, the working of the pump being regulated by the dimensions it may assume for the time being. The gases compressed by the pump are cooled by the worm and condensed in the receiver, whence the liquid sulphurous acid may be drawn off for use.—S. H.

Improvements in Decarbonating the Carbonates of Strontia and Baryta, and in Apparatus therefor. Abel and Imray, London. From H. Leplay, Paris. Eng. Pat. 8541, July 14, 1885.

The invention refers to a former specification, No. 9705, July 4, 1884, where the decomposition of the carbonates of strontia and baryta by means of superheated steam was described. The mode of proceeding has now undergone several alterations. The steam is not brought in contact with the carbonate until the latter has been raised to a sufficiently high temperature to cause its immediate decomposition. For this purpose the kiln is heated by producer gas, containing carburetted hydrogen, which, on entering into combustion, produces steam heated to a high degree, which assists in the decomposition of the carbonate. In order to obviate fluctuations in the decomposing kiln, the carbonate previous to entering the furnace is dried in a muffle, heated by the hot waste gases of the kiln. Baryta treated in this manner is reduced to a molten mass, which offers an insufficient surface to the action of the steam. The inventor, therefore, introduces into the lower part of the kiln basic aluminous or magnesian perforated blocks, which are not attacked by the molten monohydrate, and which cause the latter to flow downward in a subdivided state while subject to the action of steam.—S. H.

VIII.—GLASS, POTTERY, AND EARTHENWARE.

Improvements in Machines for Making Pottery, Glassware, and Articles of all kinds, from Soft Plastic Materials which are capable of being moulded. C. C. Thompson, of East Liverpool, Columbiana County, Ohio, U.S.A. Eng. Pat. 7937, June 30, 1885.

THE object of this invention is to provide a machine for forming articles having both straight and curved surfaces from clay, glass, paper pulp, and similar plastic materials—which are capable of being moulded—and to so construct the parts to which the shaping tools are secured that the tools will have both a reciprocating and downward and upward lateral movement in forming the article which is being made, for the purpose of preventing the material which is being shaped from being injured at its bottom by the shaping tools as they are drawn backwards after having been moved laterally for the purpose of forming the swell or concavo-convex in the article. Detail drawings are furnished.—T.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

An Improved Process for the Manufacture of Asphalt. H. Kettman, Brunswick. Eng. Pat. 12,425, September 15, 1884.

THE methods ordinarily used for the manufacture of asphalt do not result in the production of a sound and homogenous material, because the bituminous bodies used do not become so intimately incorporated with the limestone, etc., as they should do. The author proceeds as follows:—Crude bitumen is heated with hydrocarbon oils; the clayey matter is deposited. The quantity of oil used is such that at a temperature of 17° C. to 33° C. the bitumen should be capable of being drawn into threads. Limestone or asphalt stone is finely powdered and mixed with about 40 per cent. of water, forming a thin cream; 15 per cent. of the bitumen at a temperature of 70° C. is then added and the whole well incorporated. The suspension of the stone in water provides a condition under which it may be properly and thoroughly coated with bitumen. The temperature is raised to such a point that the water is finally expelled. The liquid mass is then cast into blocks and is ready for use.—C. C. H.

The Manufacture of Waterproof Cement. W. Smith, Dublin. Eng. Pat. 13,355, October 9, 1884.

EQUAL weights of finely-powdered limestone and pitch are intimately mixed. The resulting product may be used as a cement for binding together building materials or as a waterproofing material in building works. It may also be used in combination with other materials for the manufacture of waterproofing materials. —C. C. H.

A New or Improved Fibrous Fireproof and Waterproof Composition for Constructive, Decorative, and other Purposes. W. Millar and C. F. Nichols, London. Eng. Pat. 2927, March 5, 1885.

THIS material is to be applied for decorative purposes and as a substitute for papier maché, wood, etc. A mixture of powdered brickdust, pumice stone, slag wool and Portland cement is moistened with an aqueous solution of carbonate of soda and ammonia, caustic soda, chloride of magnesium or bittern water; to impart strength or flexibility, the plastic mass is applied to wire work or perforated metal, or incorporated with tow and rendered fireproof by immersion in a solution of borax, and if hardness is required, steeped in a solution of calcium chloride and a subsequent bath of silicate of soda, and finally washed in bichromate of potash.—C. C. H.

An Improved Metallic Compound for Flooring, Paving, and other Purposes. C. A. Wilkes and W. Millar, London. Eng. Pat. 7148, June 11, 1885.

THE improved compound when used as flooring does not become slippery or soften in hot weather, and sets rapidly. Blast furnace slag is broken to a fine powder and washed; if a striking colour be desired the product is mixed with oxides of iron. To three parts of slag one part of hydraulic cement is added and sufficient water, which contains in every gallon one part of bittern water, 5 per cent. of carbonate of soda, 2·5 per cent. of carbonate of ammonia, a little potash, and if rapid hardening is desired 1oz. of calcium sulphate is added to every gallon of water.—C. C. H.

X.—METALLURGY, MINING, Etc.

The Co-operation of Water in the Slow Oxidation of Zinc, Lead, Iron, and Hydrogenised Palladium. M. Traube. Ber. **18**, 1877.

THAT water assists the oxidation of the non-precious metals by air is well known, but the part played by the water has not been studied, it being taken for granted that the metals unite directly with the oxygen of the air, forming oxides. The author was the first to show that the phenomena accompanying this oxidation can only be explained by the splitting up of the water molecule (*Ber.* **15**, 663).

If metals unite with free oxygen, oxides will be produced; but should hydroxides be produced, it would be a proof that water enters into the reaction. The author finds that in the case of zinc, lead, and iron, hydroxides are produced. Further, if the water took no part in the reaction, the oxidation of these metals should take place equally well with any other liquid in presence of air—*e.g.*, absolute alcohol. But on trying, there was found to be no oxidation; alcohol diluted with water, however, did cause oxidation.

The hydrogen occluded by palladium possesses in a high degree the property of combining with the atmospheric oxygen at the ordinary temperature, and on exposing a piece of palladium foil highly charged with hydrogen, to the air, its hydrogen combines with the atmospheric oxygen so rapidly that the foil becomes red-hot. It was found that hydrogenised palladium when covered with absolute alcohol and exposed to air did absorb oxygen, but as it was in this case impossible to be certain that every trace of water was absent on starting the experiment, and the product of oxidation also being water, it is easy to see that a trace of water in starting would be capable in a short time of producing a large quantity. The author found that hydrogenised palladium placed under strong sulphuric acid did not absorb oxygen, but that it did so on diluting the acid. He obtained a similar result on using a syrupy solution of pentoxide of phosphorus as his drying agent. The author has found that neither zinc, lead, iron, nor hydrogenised palladium will act on water free from air at the ordinary temperature. The action of zinc on water and oxygen can be represented: $Zn + 2OHH + O_2 = Zn(OH)_2 + H_2O_2$, and confirming this equation, it is found that hydrogen peroxide is produced. This also shows the true nature of peroxide of hydrogen, which is to be regarded not as a higher oxide of hydrogen, nor as an oxidation product of water, but as a combination of an oxygen molecule. Lead and hydrogenised palladium also produce hydrogen peroxide on oxidation. The hydrogen peroxide produced in this manner cannot occur in large quantities, because the metals and the hydrogen are capable of reducing it again.

The author concludes that as nascent oxygen destroys hydrogen peroxide, the presence of hydrogen peroxide in these experiments shows that no nascent oxygen could have been present.—F. L. T.

Improvements in Metallurgy. Dingl. Polyt. J. **256**, 506—573.

Crucible Steel. F. C. G. Müller.—For refined steel the crucible process is indispensable. In an Austrian establishment the graphite used for crucible making in the following experiment consisted of carbon, 75 per cent.; silica, 13; alumina, 8; iron oxide, 1·8; lime, 0·2; and water, 2 per cent. The clay used contained silica, 50·1 per cent.; alumina, 33·6; iron oxide, 2·8; potash, 3·2; magnesia, 0·5; and water, 10·1 per cent. The crucibles were charged with 20 to 30kilos., and were heated in a Siemens furnace, with others, in the ordinary course of work; hard steel fusions were heated five hours; soft steel, six hours. In a crucible made of three parts graphite, and 3·25 parts clay, the following fusions were made:—

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C....	3·593	3·709	3·773	3·636	0·939	1·193	1·268	0·018	0·251	0·350
Mn..	2·038	1·910	1·856	1·861	0·210	—	0·221	0·083	—	—
Si ..	0·075	0·578	0·765	1·069	0·021	0·358	0·628	0·021	0·081	0·257
P....	—	—	—	—	0·012	—	—	0·011	—	—

Number (1) is soft Styrian pig iron; (2) is the same once melted in the crucible; (3) is twice melted, and (4) is three times melted. Number (5) is raw refinery steel; (6) is the same once melted, and (7) is twice melted. Number (8) is refinery bar iron; (9) is the same once melted, and (10) is twice melted. The ingot (9) was full of blow-holes, whilst that of (10) was quite sound. In the two following experiments—*i.e.*, analyses (11)-(16), inclusive—with crucibles of five parts graphite to one part clay, the upper part of the crucibles became perforated, so that furnace-gases had access to the contents. Later, two new experiments were made, in which only the lower part of the crucible was made of five parts of graphite to one of clay, the upper part being of the ordinary mixture—1 : 1. These pots remained sound.

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
C ..	0·915	1·130	1·150	0·018	0·720	0·675	0·910	1·308	1·623	0·010	0·671	1·336	1·125	1·118	1·106	0·090	0·321	0·390
Mn..	0·211	—	0·192	0·111	—	0·091	0·110	0·505	0·738	—	—	—	0·179	—	0·111	0·093	—	0·101
Si ..	0·031	0·313	0·622	traces	0·290	0·621	0·019	0·203	0·350	0·023	0·302	0·058	0·023	0·350	0·609	0·019	0·202	0·393

Number (11) is raw refinery steel; (12) is the same once melted; (13) the same twice melted. The crucible, as remarked above, burnt through in its upper part. Number (14) is refinery bar iron; (15) is the same once melted, and (16) twice melted. Ingot (15) was porous; whilst (16) was sound. The crucible burnt through above. Number (17) is raw refinery steel; (18) is the same once melted, and (19) the same twice melted. The crucible remained sound, as remarked above; its upper part being composed of one part graphite to one part clay. With (18) and (19), one per cent. of manganese oxide was placed in the crucible with each charge. Number (20) is refinery bar iron; (21) the same once fused, and (22) twice fused. As in the previous experiment, the crucible remained sound. Ingot (21) was blown; (22) was sound. Number (23) is raw refinery steel; (24) the same fused in a new English plumbago pot; (25) the same twice fused. Number (26) is refinery bar iron; (27) is the same once fused in a once-used English plumbago crucible; (28) the same twice fused. Both ingots were blown.

In graphite crucibles of the ordinary make, as well as of those richer in graphite, both hard and soft steels take up about 0·3 per cent. of silicon. In crucibles of the former character, about 0·2 per cent. of carbon is taken up by the steel, whilst in the more graphitic crucibles 0·45 per cent. of carbon is absorbed at a tool-steel heat, and 0·6 per cent. at a scythe-heat. The manganese is unaffected. Manganese is reduced from oxide added to the charge, and the amount of silicon is at the same time reduced. Only the carbon is attacked when furnace gases have access to the charge. The silica present in graphite appears to be more easily reduced than that in the clay. In clay pots, practically no silicon is absorbed by the steel.

Gases in Steel. Müller thinks that the gases cannot be expelled by any purely physical process. He states that Wasum fused some Thomas-steel in a clay pot without any admixture. After three hours' heating, on casting, *the ingot boiled up much more than the original* metal. The metal before melting contained: Carbon, 0·015 per cent.; silicon, 0·011; phosphorus, 0·023. After melting it contained: Carbon, 0·020; silicon, 0·023; phosphorus, 0·034.

Tungsten-Iron Alloy. L. Schneider.—An alloy of specific gravity 9·306 at 17° contained: Iron, 68·36 per cent.; tungsten, 28·18; manganese, 0·99; cobalt and nickel, traces; silicon, 0·23; phosphorus, 0·01; sulphur, traces; carbon, 1·88. On boiling with hydrochloric acid a metallic powder was obtained, which could be easily separated into two portions by means of a magnet, whilst only traces of tungsten were dissolved. The non-magnetic portion, composing about ninety per cent. of the whole, consisted of light-grey, well-formed octahedra, hard enough to scratch glass, but brittle enough to be ground in an agate mortar. The amount of iron varied between twenty-four and thirty-one per cent., and the carbon between 1·4 and 1·6 per cent. The magnetic portion was dark-grey, metallic, and, under the microscope, had a frothy appearance. It contained: Iron, 68·1 per cent.; tungsten, 27·7; and carbon, 4·1.

Tungsten-steel of the following composition: Iron, 85·00 per cent.; tungsten, 11·03; manganese, 1·49; silicon, 0·26; phosphorus, 0·01; carbon, 2·15; left 13·1 per cent. of a fine non-magnetic powder on being heated with hydrochloric acid. This powder contained: Iron, 22 per cent.; carbon, 1·1; thus agreeing in composition with the crystalline powder above. On the other hand, soft steel containing tungsten, when treated with dilute hydrochloric acid (1 : 8), leaves only traces undissolved of tungsten containing iron. Carbon, silicon, phosphorus, etc., harden steel; tungsten acts similarly, but the former combine with the iron, whilst the latter remains uncombined, consequently a considerable amount of tungsten is necessary to produce a hard steel. Such a steel resists atmospheric corrosion, and damascenes beautifully, owing to the tungsten present.

Copper Refining.—W. Braun (Ger. Pat. No. 31276, May 27, 1884) proposes to pass gaseous hydrochloric *acid through molten* copper, with exclusion of air as much as possible. The red oxide is volatilised as chloride, and all other metals present as oxides, and all metals capable of decomposing hydrochloric acid are also removed. *Very tough, compact copper results,* which has a high electric conductivity. The copper can be cast solid in moulds filled with an indifferent gas.

Oxygen in Metals and Alloys. A. Ledebur.—This should always be determined by ignition in hydrogen, as a portion is frequently present as oxide. The following amounts of oxygen were found in the various metals and alloys given: Commercial copper, 0·227 per cent.; sheet copper, 0·124; compact copper fused under common salt, 0·092; cast bronze with four per cent. tin, Royal Gun Works, Spandau, 0·070; gun bronze with ten per cent. tin, from the same works, 0·051; ancient bell metal, containing copper, 72·5 per cent.; tin, 23·7; lead, 1·8; the oxygen was 0·126 per cent.; manganese bronze from Spandau, with manganese 0·14 per cent.; iron, 1·55; tin, 5·86 per cent.; the oxygen was 0·036; phosphor bronze from the same, phosphorus, 0·004 per cent.; oxygen, 0·038; Berlin cast brass, 0·033; Vienna cast brass for sheet, 0·015; cast nickel from Pfannesteil, brittle, unmalleable, 0·304; malleable nickel from the same (without magnesium addition) in sheet, 0·084; Fleitmann's sheet-nickel (with magnesium addition) from Iserlohn, 0·095; cast German silver, 0·061.—J. T.

Slow Oxidation of Copper in Presence of Dilute Sulphuric Acid or Solution of Ammonium Carbonate. M. Traube. Ber. **18**, 1887.

The author finds that copper is not acted on by water, either in presence or absence of air. When, however, it is in contact with dilute sulphuric acid in presence of air, or of a solution of ammonium carbonate in presence of air, it is dissolved with simultaneous production of hydrogen peroxide:—

$$Cu + SO_4H_2 + O_2 = CuSO_4 + H_2O_2$$
$$Cu + CO_3(NH_3)_2 . H_2 + O_2 = Cu(NH_3)_2CO_3 + H_2O_2$$

The hydrogen peroxide does not occur in large quantities, because it is again destroyed by a secondary reaction:—

$$Cu + SO_4H_2 + H_2O_2 = CuSO_4 + 2H_2O$$
$$Cu + CO_3(NH_3)_2H_2 + H_2O_2 = Cu(NH_3)_2CO_3 + 2H_2O$$

Copper by itself in absence of air is unable to decompose either dilute sulphuric acid or a solution of ammonium carbonate.—F. L. T.

Zinc Analyses. L. Schneider and H. Peterson. Dingl. Polyt. J. **256**, 518.

	I.	II.	III.	IV.
Lead............	1·1183	1·7772	1·1921	0·623
Iron	0·0280	0·0280	0·0238	0·032
Cadmium	0·0215	—	—	0·051
Copper..........	0·0002	—	0·0002	traces
Silver	0·0017	traces	0·0007	traces
Arsenic	traces	—	—	—
Antimony	—	—	traces	—
Bismuth	—	—	traces	—
Sulphur	traces	0·0020	traces	traces

I. George Works of the Silesian Union; II. The same, brand C H; III. G. v. Giesche's Estate; IV. Sagor Works.—J. T.

Influence of Silicon on the Properties of Cast-iron. Thomas Turner. J. Chem. Soc. 1885, 577.

Authorities differ as to the influence of silicon on cast-iron, the general opinion being that it is injurious. The author shows that under certain circumstances it slightly increases the tenacity of cast-iron.

Table A.—*Summary of Tensile Tests* (by Professor Kennedy).

U. C. L. Test Numbers.	Silicon per cent.	Breaking Load per square inch.		Modulus of Elasticity.
		Pounds.	Tons.	
8807	0	22,720	10·11	25,790,000
8118	0·5	27,580	12·31	28,670,000
8117	1	28,190	12·72	31,180,000
8116	2	35,180	15·70	23,560,000
7867	2·5	32,760	14·62	25,450,000
8115	3	27,390	12·23	21,150,000
8114	4	25,280	11·28	15,610,000
8891	5	22,750	10·16	18,720,000
7866	7·5	11,950	5·31	11,750,000
7865	10	10,630	4·75	13,930,000

Table B.—*Results of Analyses* (by T. Turner and J. P. Walton).

U. C. L. Test Nos	Total Carbon.	Graphite.	Combined Carbon.	Silicon.	Phosphorus.	Manganese.	Sulphur.
8807	1·98	0·38	1·60	0·19	0·32	0·14	0·05
8118	2·00	0·10	1·90	0·45	0·33	0·21	0·05
8117	2·09	0·24	1·85	0·96	0·33	0·26	0·01
8116	2·18	1·62	0·56	1·96	0·28	0·60	0·03
7867	1·87	1·19	0·68	2·51	0·26	0·75	0·05
8115	2·23	1·43	0·80	2·96	0·34	0·70	0·01
8114	2·01	1·81	0·20	3·92	0·33	0·81	0·03
8891	2·03	1·66	0·37	1·71	0·30	0·95	0·05
7866	1·86	1·48	0·38	7·33	0·29	1·36	0·03
7865	1·81	1·12	0·69	9·80	0·21	1·95	0·01

The author made "pure cast-iron," and melted it with varying quantities of silicon iron, with a view to obtaining the quantities of silicon in the second column of table A. The mechanical tests were performed by Prof. A. B. W. Kennedy, at University College, London, and the results are in Table A. Table B gives the check analyses of the samples after the mechanical testing. This table also confirms the fact first noticed by Sefström, and mentioned by Percy, that in cast-iron which contains much silicon, the carbon chiefly occurs in the graphitic state.—F. L. T.

Blast Furnace Working. H. v. Jüptner. Chem. Zeit. 1885, 888—890.

The data obtained from a week's working of a charcoal blast furnace, were as follows: Ore charged, 249,600 kilos.; iron washed from slag, 6000kilos.; limestone, 26,100kilos.; charcoal, 106,480kilos. There were produced: pig iron, 114,600kilos.; slag, 64,600kilos.; flue dust (dry), 3275kilos.; iron washed from slag, 6000kilos. Average temperature of the blast = 350° C. Blast pressure (average) 60mm. water; diameter of tuyeres, 55mm.; mean temperature of waste gases, 127° C.; average moisture in blast, 0·87 per cent. by weight; mean temperature of the air, 17° C.; mean barometric height, 710mm. The materials given above had the following composition :—

	Ore.	Limestone.	Slag.	Flue Dust.	Charcoal.
Potash	—	—	—	0·85	0·10
Soda	—	—	—		0·06
Lime	0·92	50·08	26·25	6·35	0·79
Magnesia	4·72	0·60	16·07	3·39	0·17
Iron protoxide	20·27	—	5·56	16·59	—
Iron sesquioxide	41·18	—	—	40·50	0·01
Alumina	2·11	0·16	7·07	2·95	—
Manganese protoxide	2·80	—	3·89	2·98	—
Copper oxide........	0·076	—	0·13	0·06	—
Silica	12·85	0·11	39·99	13·75	0·17
Sulphuric anhydride	0·288	0·03	1·01	0·30	0·03
Phosphoric „	0·288	0·03	0·007	0·072	0·05
Carbonic „	2·32	43·15	—	6·79	0·63
Water	12·50	1·58	—	—	10·25
Carbon	—	—	—	4·75	86·25
Nitrogen	—	—	—	—	0·52
Hydrogen (disposable)	—	—	—	—	1·01
	100·322	100·07	100·07	99·872	100·31

Pig iron :—Iron, 91·761 ; combined carbon, 0·892 ; graphite, 2·800 ; silicon, 1·800 ; sulphur, 0·018 ; phosphorus, 0·042 ; manganese, 2·650 ; copper, 0·032. The average composition of the waste gases in volumes, per cent., was : Carbon dioxide, 8·5 ; oxygen, 0·4 ; carbon monoxide, 28·1 ; marsh gas, 0·8 ; hydrogen, 7·1 ; nitrogen, 55·1. The amount of the various constituents, per 10,000 kilos. of pig iron, is calculated, and an attempt is made to balance the various items. The thermal account is balanced as follows :—

	Heat units.		Per cent.
(A) HEAT PRODUCED.			
Carried into the furnace by the blast......	3055392·2	=	9·23
Added in the charge	87127·3		0·26
Produced in the furnace	29940211·0		90·51
Total..	33082736·5		100·00
(B) HEAT CONSUMED.			
Chemical work in the furnace	16521893·5	=	49·94
Evaporation of water in the charges......	2545978·8		7·69
Fusion of pig iron and slag..............	5713730·0		17·36
Heat lost in flue dust	24156·3		0·07
„ „ waste gases	1799230·3		5·43
„ „ by radiation and conduction ..	6447447·6		19·51
Total..	33082736·5		100·00

—J. T.

Ferro-Chromium Alloys. L. Schneider. Chem. Zeit. 1885, 924—925.

AN alloy containing about 50 per cent. chromium dissolves at first, when warmed with hydrochloric acid, with evolution of gas. But the action is soon stopped by a coating of oily hydrocarbon which collects on the metallic particles. This hydrocarbon is formed in considerable quantity. On removing mechanically the crystalline powder obtained from the pieces of alloy, and heating, or treating with alcohol and ether to get rid of the hydrocarbon, a large portion of this can be dissolved, and in this way alloys with 66 per cent. of chromium may be dissolved. This difficultly soluble alloy consists of minute crystalline needles. It may also be obtained from ferro-chromium by treating with copper chloride, then with caustic alkali, alcohol, ether, and finally igniting in hydrogen. The crystals contain—Chromium, 66·2 ; iron, 24·9 ; carbon, 8·5 ; nearly corresponding to the formula, $Fe_4CCr_{12}C_4$.—J. T.

The Use of Explosives in Mines. Chem. Zeit. **9**, 1088.

THE following notice has been issued by the authorities of the Cologne Mining Association (Bergwerksverein) :—In all workings where fire-damp occurs, blasting with gunpowder and similar slowly-exploding agents is prohibited, not only in the coal measures themselves, but also in the adjoining rock, only the use of dynamite and quickly-exploding agents like dynamite, equally inoffensive as regards coal dust, being permitted. But, blasting with dynamite is not even permitted in those parts of the workings where such accumulations of fire-damp may under ordinary circumstances collect, that the burning of the safety lamp is sensibly affected (3 per cent.).—G. H. B.

Treatment of Complex Metallic Ores or Solutions. G. I. J. Wells, Liverpool. Eng. Pat. 12,317, September 12, 1884.

THE author claims the fractional precipitation and separation successively of the metals contained in complex metallic solutions, by means of decomposable sulphides added in such successive portions as shall be necessary to separate from their solutions, and from each other, the metals—copper, lead, zinc and iron. The complex solution obtained from the drainage of alkali waste is suitable as a precipitant.—J. T.

Improvements in Apparatus for the Amalgamation of Gold and Silver. George Washington Moon, Regent Street, Middlesex. Eng. Pat. 12,930, September 29, 1884.

BY means of an intermittent rotary motion in a vertical plane, the mercury is forced round an oval curve, into the top of which the ore is introduced. Two or more of these curves may be arranged in series for the more efficient amalgamation of the ore. Any flour of mercury which might pass away is caught and retained in an egg-shaped cavity, over which the tailings pass before leaving the machine. Between the curve and this cavity movable amalgamated copper plates are placed.

—W. G. M.

Coating Vessels of Copper or Copper Alloys with Lead. J. S. McDougall, Chadderton. Eng. Pat. 15,800, December 1, 1884.

THE surface of copper, or copper alloy, to be coated, is cleaned, and is coated with zinc chloride (or its equivalent in this application), and afterwards a coating of lead of any thickness is attached by means of heat applied in any suitable manner.—J. T.

Improvements in the Reduction of Iron or Zinc Ores. W. R. Lake, London. From G. M. Westman, Stockholm, Sweden. Eng. Pat. 15,861, December 2, 1884.

THE apparatus consists of three furnaces, two heat regenerators, two air-heating chambers, suitable connecting pipes, and four valves. The furnaces have closed mouths, shafts and hearths. Two powerful blowing engines are provided, one for the gases and the other for the blast. In working zinc ores, the central furnace is charged with briquettes of calcined zinc ore and coal powder. The outer furnaces are filled with fuel only, are used alternately as condensers, of zinc vapour, and as gas generators respectively. In working iron ores, the central furnace is filled with fuel only, whilst the outer furnaces are filled with fuel, ore, and fluxes as in an ordinary blast furnace. While the ore is reduced in the one outer furnace, the ore already reduced is melted in the other outer furnace. The central furnace is used to regenerate or again carburet the gases arriving from the reducing furnace.—J. T.

Smelting Sulphide of Antimony. N. C. Cookson, Newcastle-on-Tyne. Eng. Pat. 3386, March 16, 1885.

THE reduction of antimony sulphide is to be effected by pouring over it molten iron. The sulphide is placed in a ladle lined with refractory material, and the molten iron is poured over it, thus avoiding the use of crucibles. After the decomposition has been thus effected, the contents of the vessel are poured into a receiver, and after cooling the products separated in the usual way.—J. T.

Manufacture of Iron Sponge, Iron, and Steel. W. R. Lake, London. From C. J. Eames, New York, U.S.A. Eng. Pat. 6429, May 26, 1885.

Iron ore is intermingled with an impure graphite, known as "graphitic carbon," and after being heated by waste gases from the furnace, it is more strongly heated on the hearth of a reverberatory furnace. This furnace has, by preference, an improved hearth formed of friable graphitic lumps. After the ore is reduced on this hearth it is passed over to a second hearth nearer to the fire, and the spongy mass is there balled up.—J. T.

Improvements in the Manufacture of Iron Sponge, Iron, and Steel. W. R. Lake. From C. J. Eames, New York. Eng. Pat. 6430, May 26, 1885.

Claims to make wrought iron direct from ores by melting the ores in a furnace having its hearth composed of a mixture of graphite, pulverised fire-brick, and coal-tar or molasses, or their equivalents. The remaining claims are substantially covered by the preceding specification. —J. T.

Improvements in the Manufacture of Iron Sponge, Iron and Steel. W. R. Lake. From C. J. Eames, New York. Eng. Pat. 6431, May 26, 1885.

The inventor proposes the use of a stiff paste made from pulverised graphite, and an adhesive carbonaceous cement, such as tar or molasses, which paste can be readily applied as an adhesive covering to the ore. —J. T.

Improvements in the Thomas-Gilchrist Process. W. P. Thompson, London. From R. Osann, Potsdam, Prussia. Eng. Pat. 8392, July 11, 1885.

By fusing a mixture of sodium or potassium carbonate with iron sesquioxide or manganese sesquioxide, an anhydrous refractory compound will be obtained which, when treated with water, gives a solution of caustic soda or caustic potash with separation of iron or manganese sesquioxide. If, instead of adding the usual lime flux to the Thomas converter, the above mixture be used, caustic alkalis can thus be cheaply produced, and the phosphoric, chromic, vanadic, or other acids formed in the Thomas-slag, are rendered easily soluble in water. —J. T.

Obtaining Aluminium and other Metals from their Ores. W. P. Thompson, London. From E. H. Cowles and A. H. Cowles, Cleveland, Cuyhogo Co., Ohio, U.S.A. Eng. Pat. 9781, August 18, 1885.

The object of this invention is the reduction of aluminium from its ores by electricity and its production in a pure state or as an alloy with other metals. In a prior application for Letters Patent 6994, June 9, 1885, a process of smelting ores and reducing the salts of refractory metals by means of electricity is described, consisting in the use of pulverised carbon made incandescent by the passage of an electric current, and in carrying out the present invention the said process is preferably used. Ores of alumina are reduced in the said furnace by mixing them with granular carbon and passing an electric current through the mixture; but the product thereby obtained contains a considerable percentage of carbon which is taken up both chemically and mechanically by the aluminium. If, however, the ore of aluminium be reduced in company with tin, copper, manganese or other metal which will alloy with the aluminium, very little if any of the carbon is taken up. The alloying metal may be subsequently separated from the aluminium by amalgamation, lixiviation, or equivalent process, leaving the aluminium in the form of an amorphous powder. The method consists in mixing with the broken charcoal pieces of the metal which is to constitute the base of the alloy, whereby it is melted by the incandescent carbon and takes up the other metal, whatever it may be, that is being reduced.—J. T.

XI.—FATS, OILS, AND SOAP MANUFACTURE.

Process for Converting Petroleum and similar Hydrocarbons into Acids, Soaps, and Compounds analogous in constitution to Resins and Ethers. J. Imray. From Dr. Eugen Schaal, of Stuttgart. Eng. Pat. 12,806, September 25, 1884.

Petroleum and hydrocarbons resulting from the dry distillation of coal, shale, peat, etc., are heated with caustic alkalis, their carbonates, alkaline earths, or other substances having an alkaline reaction, with or without pressure, in a current of air or oxygen; the hydrocarbons are said to be converted into acids, and to form soaps. These are removed, and decomposed with mineral acid, the resulting acids being separated by distillation, fractional precipitation, or extraction with benzene or petroleum. Other oxidising agents are also employed, such as chloride of lime, at from 130° to 200° C., after which the lime is removed by hydrochloric acid, and the remaining oil compound (after separation of the acids) is treated with about 50% caustic soda at from 200° to 300° C. In some cases nitric acid is employed in the gaseous form together with a strong current of air, at about 100° C. Super-oxidation, which sometimes occurs with the liquid acids, apparently by formation of dry acids, can be brought back again by treatment with zinc powder. The separate fractions of the acid mixtures resulting from oxidation of the hydrocarbons may be used partly for the production of ether-like bodies, partly for soaps, and partly may be themselves used as such. The most volatile acids give, with methyl, ethyl, butyl, and amyl alcohols, useful aromatic ethers suitable for perfumes. The acids of higher constitution are very nearly related to oleic acid.—W. L. C.

Improvements in Apparatus for Solidifying Paraffin in Oils. F. N. Mackay and W. Baxter. Eng. Pat. 14,114, October 25, 1884.

The oil is cooled in tanks surrounded with a refrigerating medium, and these tanks are provided with scrapers and agitators worked from an overhead shaft, and used in such a manner as will best ensure (1) the contents being mixed while cooling is being done, and (2) the cooling surfaces being continually freed from frozen paraffin. The whole mass is gradually brought down nearly to the temperature of the refrigerating medium, after which the discharge-ways are opened, and the contents of the tanks are allowed to flow to the press pumps. Drawings are given.—W. L. C.

Improvements in the Preparation of Oils used for Lubricating Wools preparatory to Spinning. C. Rumble and F. Sear. Eng. Pat. 15,031, November 14, 1884.

To avoid the tendency to spontaneous heating in such oils, some metallic or ammonium salt or salts of fatty or resinous acids are dissolved therein, prior to their use. In practice about 10% of sodium oleate is dissolved in the oil at a temperature not exceeding 260° F.—W. L. C.

Improvements relating to the Purification of Fatty or Oleaginous Substances, and Apparatus therefor. W. R. Lake. From A. F. de Nugé, Paris. Eng. Pat. 15,531, November 25, 1884.

This patent contains the description, illustrated by drawings, of special mechanical arrangements for subjecting oils to the successive action (1) of caustic alkali, (2) of a current of steam, for purposes of purification. Three sets of vessels are described, in all of which the operations are continuous. In the first, the oil and alkali are mixed, and separated again; in the second, or "vaporising column," the oil is well steamed; in the third, the soap formed in the first operation is decomposed.—W. L. C.

Preparation and Application of Improved Hygienic and Disinfecting Substances, for use as Candles, Nightlights, Tapers, Lamp-oil, and such-like, or as External Remedies. E. B. Watson and H. B. Fulton. Eng. Pat. 9341, August 5, 1885.

For illuminating purposes, 1 oz. of sublimed iodine is dissolved in about 50lb. of solid paraffin (for candles) or in from 7 to 10 gallons of paraffin oil. For external remedies, in lieu of "tincture of iodine," the solution of iodine in petroleum spirit, etc., may be painted on the affected part, or solid paraffin impregnated with iodine may be used as a plaster.—W. L. C.

An Improved Process for Preserving Crude Animal Fats. P. A. Newton. Eng. Pat. 9380, August 6, 1885.

Crude fats are soaked for two days in a saturated solution of salicylic acid at 35° C., and are then packed in hermetically closed casks which are filled up with the solution.—W. L. C.

XII.—PAINTS, VARNISHES, AND RESINS.

Improvements in Vulcanised Kerite Compounds, and in Processes for the Manufacture of the same. H. J. Allison. From A. G. Day, of New York City. Eng. Pats. 8786 and 8787, July 21, 1885.

In 1878, A. G. Day patented indiarubber substitute, in the manufacture of which sulphur was heated with mixtures of oils and tar, and wax was used to moderate the intensity of the action of the sulphur. According to the present patents, one-half of this sulphur is to be replaced by an equivalent quantity of a metallic sulphide—as, *e.g.*, that of antimony. This not only performs the vulcanising function of the sulphur, but serves as "the heat controller," an office which, it is stated, it is impossible for sulphur used alone to fulfil. Small quantities of vegetable astringents are also incorporated with the mass, all operations being conducted between about 230° and 280° F.—W. L. C.

XIV.—AGRICULTURE, MANURES, Etc.

Hydration of Soils. H. Hellriegel. Rep. Anal. Chem. 5, 242.

The author has investigated the rate of hydration of soils of average composition in an atmosphere saturated with aqueous vapour. The specimens were previously dried, and were exposed in the form of a column 70mm. in height by 50 in diameter, being contained in glass cylinders of corresponding dimensions. The absorption proceeds rapidly at first, one-half of the water taken up during 700 hours' exposure being absorbed during the first 100 hours. (Comp. *Chem. News*, 44, 101, 209.)

The author also investigated the downward passage and distribution of water through columns of soil, with the view of throwing light upon the appropriation of the rainfall. The phenomena observed are, in respect of the same soil, similar to those of the motions of liquids in capillary tubes, and vary in intensity in proportion to the fineness of division of the soil. In regard to the retention of water, variations are observed with variations in composition of the soil. At the conclusion of the experiments the quantity held *(a)* by garden mould was 20·5 per cent.; *(b)* by a sandy loam, 23·3 per cent.; and *(c)* by sand, 19·3 per cent. (Cf. *Centralb. f. Agrikulturchem.* 14, 840).—C. F. C.

On New Species of Potatoes. Christy. New Commercial Plants and Drugs, No. 8.

Besides our potato-bearing *Solanum tuberosum*, there are, amongst the 700 species of solanum, about five which also bear tubers—*S. Commersonii, maglia, immite, verrucosum, Jamesii*,—of these *S. Commersonii* has been cultivated in its native country perhaps for some time. Experiments have been made in England to introduce some of these species and to cross them with the ordinary potato, in order to obtain a product which might possibly not be susceptible to the potato disease. *Solanum maglia* grows in its native country, Chili, on the seashore, in loose sandy ground, and has externally much similarity with *S. tuberosum*. The plant appears to be especially suitable for England, and has been already cultivated in Chiswick in the first quarter of this century, where it produced abundantly, as many as thirty tubers on each plant, of quality equal to the ordinary potato. Recently sixty-one tubers were planted in two sections, in which those of a light colour were separated from those of a red colour. The tubers gathered were nearly all red. On the other hand, the tubers originally planted were only of the size of pigeons' eggs, but those obtained by cultivation were considerably larger. When cooked they proved of good quality. Crossing with the best sorts of ordinary potato gave some ripe berries with an abundant quantity of seeds. *S. Commersonii (S. Ohrondii)* occurs in Uruguay, Buenos Ayres, and Argentine, prefers stony ground, and likewise resembles the *S. tuberosum*. Cultivation experiments had little success, only a few tubers being obtained. A third sort, *S. Jamesii*, has external characteristics differing very perceptibly from the others; it grows about 10 inches high, and is distinguished by its very narrow leaves. It produced tubers abundantly, but these were considerably smaller than those originally planted. The tubers of the last two sorts were ripe earlier than those from *S. maglia*.
—G. H. B.

Improvements in Deodorising Substances for Manures. W. H. Samson, Maidstone. Eng. Pat. 13,080, October 2, 1884.

Excrementary matter is caught in receivers containing any of the disinfectants now in common use. It is afterwards carried away in hermetically-sealed tanks and reduced by evaporation to a dry powder suitable for fertilising purposes.—C. C. H.

XV.—SUGAR, GUMS, STARCHES, Etc.

Apparatus for the Manufacture of Sugar. Dingl. Polyt. J. 256, 503—506.

C. Scherer proposes to make cloth *filter-bags* withstand greater pressure by placing them within a net of wire gauze. An arrangement is also shown in which the filter is surrounded by a steam jacket.

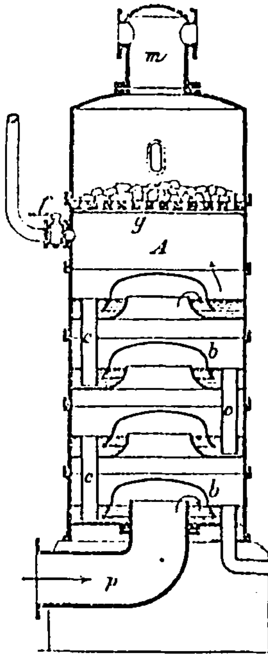


Fig. 1

Apparatus for Washing Carbonic Anhydride.—The gas used in the Napajedl and Raigern sugar works is obtained from limekilns. It enters the cast-iron cylinder A (Fig. 1) through the pipe *p*, and is constrained to pass through the water in the successive trays by means of the caps *b*. A layer of limestone on the grid *g* frees the gas from the water carried up mechanically, and also from sulphurous anhydride. The washed gas passes away through *m*; the wash-water is admitted at *f*, and flows away at *o*.

Fig 2.

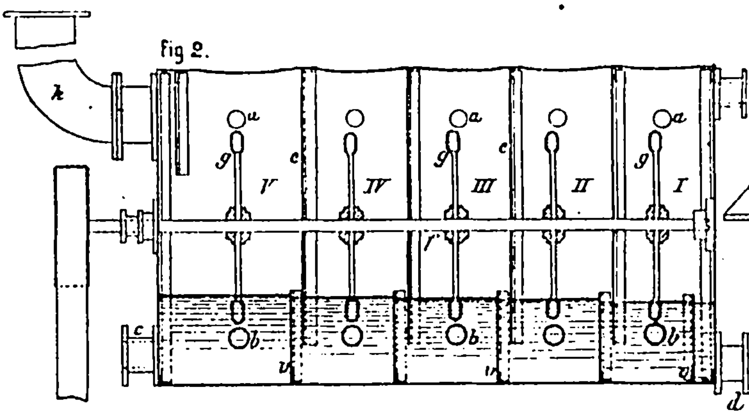


Fig 3

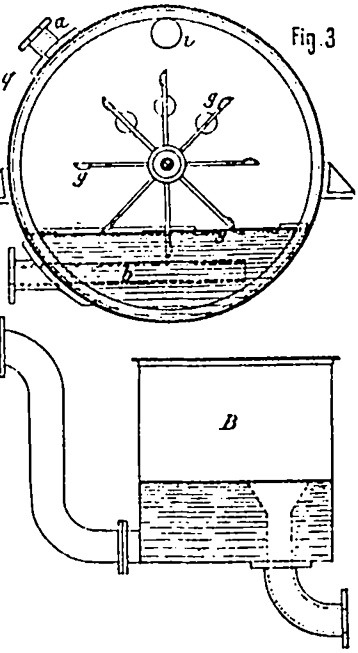


Fig.5.

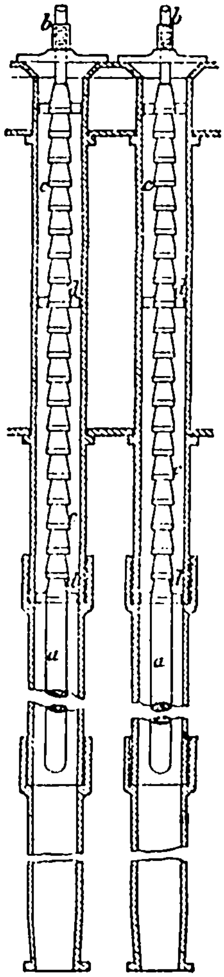


Fig. 4.

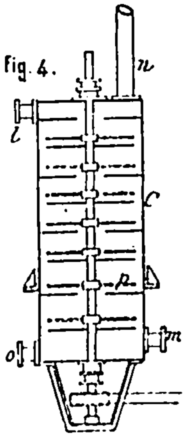


Fig.7

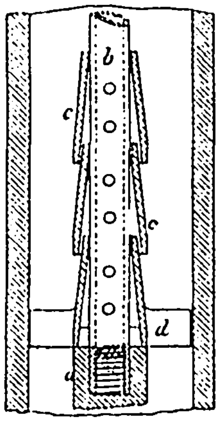


Fig.8

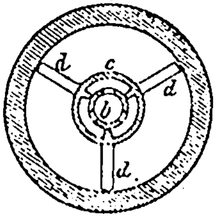
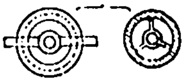


Fig.6.



Saturating Tank for Carbonic Anhydride.—Forstreuter Bros. (Ger. Pat. 29,039, March 11, 1884) construct the apparatus as shown in Figs. 2, 3 and 4. The tank is divided into compartments by the partitions *c c* and *v v*. The syrup enters at *c* and leaves the tank at *d*, and passes into the test tank B, from whence it goes to the boiler. In each compartment is an agitator, *g*. Usually the gas is introduced by the perforated tubes *b* into the two chambers I. and II. only, and from these it passes to the other chambers by means of the perforations *i* in the partitions, passing away finally through *k*. Or the gas from *k* may be passed into the apparatus (Fig. 4) at *m*, through which the syrup and milk-of-lime is passed from *l* to *o*, and thence into the main tank at *c*. The gas can also be passed into the main tank at *g*, if necessary, as well as, or instead of, at *b*

Gas-extraction Tube for Bone-black Retort. — A. Schneider (Ger. Pat. 29,048, April 13, 1884), describes a massive cast-iron hanging retort (Figs. 5, 6, 7 and 8), down the centre of which passes a perforated gas-tube *b*, which is surrounded by small conical sleeves, *c*. Each sleeve has three ribs inside to keep it in position and to maintain a passage for the gases from the bone-black to the tube.

Steam-worm for Vacuum-pan.—F. Hallström (Ger. Pat. 29,538, April 30, 1884) proposes to gradually reduce the diameter of the worm from 150mm. where the steam enters to 50mm. where the steam leaves, in order to increase the efficiency of apparatus.

Horizontal Steam Apparatus.—F. Weigl describes an arrangement of horseshoe-shaped steam tubes which can be easily kept steam-tight. Figs. 9 and 10 show that the heating space is divided into three main compartments by means of two fixed partitions. Each compartment is divided into two smaller ones by movable partitions screwed on to the tube-plate, one of the smaller chambers being the steam-entrance side and the other being the steam-exit side. The steam passes through two similar large valves on both sides of the apparatus simultaneously to the two outer chambers *a*, returning through the neighbouring chamber *b;* thence it passes from both sides into *c*, and through the middle system of tubes to *d*.

Fig. 9

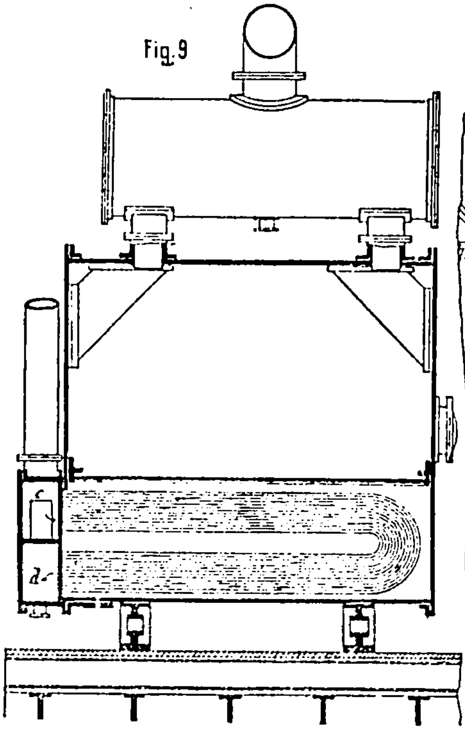
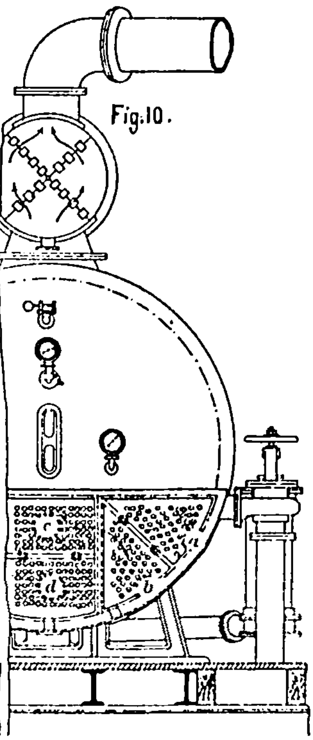


Fig. 10.



Vacuum-pan Exhauster.—P. Hambruch (Ger. Pat. 30,491, June 22, 1844) proposes to employ an ejection apparatus worked by a liquid which readily absorbs water, the liquid to be passed back to a reservoir tank by means of a pump.—J. T.

The Treatment of Bone-black. P. Degener and J. Lach. Dingl. Polyt. J. **256**, 519; and Ger. Pat. 31,358, June 6, 1884.

FRESHLY-IGNITED bone-black moistened with as much water as it can take up, and exposed to light and air, produces, even in two or three minutes, a perceptible quantity of hydrogen peroxide. Bone-black thus treated is much more active than the unmoistened material. The purification of exhausted bone-black can be conducted completely, or partially and completed in the ordinary way, when the process is much facilitated by the hydrogen peroxide produced. In practice forty-eight hours give good results when the layers are 3 inches thick and are frequently sprinkled and turned over. If milk-of-lime be sprinkled over the bone-black, peroxide of the alkaline earth is produced; the same thing holds good for other earths and the alkalis.—J. T.

On the Non-crystallisable Products of the Action of Diastase upon Starch. H. T. Brown and G. H. Morris. J. Chem. Soc. 1885, 527.

THE authors give a historical *resumé* of the above subject, and add that the present paper must be looked upon as a continuation of a previous paper by one of them (Brown and Heron, *J. Chem. Soc.* 1879, 596). The previous paper confirmed O'Sullivan's statement, that the properties of the products of the transformation of starch by diastase can be accounted for by the presence only of maltose and a non-reducing dextrin with a rotary power of $[\alpha]_{j\,3\cdot86}=216^\circ$.

The authors found, contrary to O'Sullivan, that the dextrins separated by alcohol from any starch transformation are susceptible to the action of diastase to the same extent as before separation. By fractionating a dextrin by repeated partial precipitation with alcohol, and then hydrolysing by malt extract or diastase the separate fractions, and ascertaining the amount of maltose produced from each, it is possible to determine whether a particular dextrin is a single substance or a mixture of dextrins. The authors found, for instance, that the dextrin in their No. 8 equation is a mixture.

The authors found it impossible to prepare a non-reducing dextrin either by fermentation or by precipitation with alcohol. Bondonneau's method (*Bull Soc. Chim.* 21, 50 and 149), by boiling with cupric chloride and sufficient caustic soda to redissolve the precipitate first formed, and then filtration, acidification, and precipitation by alcohol, was not found satisfactory by the authors. They were, however, very successful with an application of Wiley's modification of Knapp's alkaline mercuric cyanide solution process (*Chem. News*, 46, 175), which had the great advantage, in addition to the production of dextrins free from reducing power, of not hydrolysing the dextrin during the process.

The authors have found that a new body, to which they give the name of malto-dextrin, is produced by the limited action of malt extract upon starch. Herzfeld described, in 1879, a new product, which the authors consider must have been malto-dextrin in an impure condition. The authors' malto-dextrin is non-fermentable by *saccharomyces cerevisiæ* of the high fermentation; by diastase it is converted completely into maltose; alcohol only acts upon it as a whole, and does not precipitate dextrin from it. A mixture of maltose and dextrin having the same optical and reducing properties, is readily separated by alcohol into maltose and dextrin; diastase always leaves some dextrin unacted on, and the maltose readily ferments. The authors consider the composition of malto-dextrin to be $\left\{\begin{array}{l}C_{12}H_{22}O_{11}\\(C_{12}H_{20}O_{10})_2.\end{array}\right.$ Although malto-dextrin is unfermentable by the "top yeast," yet "bottom yeast"—*e.g.*, *saccharomyces ellipticus* and *S. pastorianus*—has, under certain conditions, the power of hydrolysing and then fermenting.

A further proof of the homogeneity of malto-dextrin is supplied by dialysis, a mixture of maltose and dextrin, having the same optical and reducing properties being split up into dextrin and maltose by dialysis, whilst malto-dextrin dialyses as a whole.—F. L. T.

Improvements in the Manufacture of Sugar and in Apparatus therefor. A. Fesca, Berlin. Eng. Pat. 12,469, September 16, 1884.

The author states that in the manufacture of cube sugar, either in the form of prisms or plates, a uniform product is not obtained, because the liquor used in the process of liquoring in the centrifugal does not evenly penetrate the mass, owing to the obstructions offered by the partitions of the mould. This he proposes to overcome by constructing the moulds, formed of plates, as at present, with tongues or projections, so that when the whole are bolted together, an upper chamber is formed above the mould. After the sugar has been run into the moulds and centrifugated, the upper part is filled with "thick liquor" or "liquor paste," made from sugar dust. When this has set, by the withdrawal of liquor from it by absorption, the moulds are again placed in the centrifugal, and liquored in the usual way. The mass of sugar in the upper part of the moulds over the moulded portions, serves as an intermediary, and evenly distributes the liquor through the plates or prisms beneath, and this results in the formation of a more uniform product. The claims are (1) the process of "preliminary liquoring while at rest;" (2) the form of mould which enables this to be accomplished; (3) the constructions of the moulds for prisms; (4) the construction of the moulds for plates. —C. C. H.

Improvements in the Manufacture of Grape-Sugar or Glucose. W. R. Lake. From W. T. Jebb, Buffalo, U.S.A. Eng. Pat. 6140, May 19, 1885.

In manufacturing glucose from Indian corn, it has been the practice to eliminate the hulls, gluten and germs from the starch by grinding the corn with water, then separating the coarse offal from the starch by sifting upon sieves, which are supplied with sprays of water, whereby the starch is washed through the meshes of the sieve, while the offal passes off over the tail; then separating the gluten and oil from the starch by treatment with caustic alkali, and repeatedly depositing and washing the starch, and then converting the refined starch so obtained. This process requires large quantities of water, and capacious receptacles for settling the starch, and is comparatively costly, while it leaves the offal in a wet, undesirable condition. It has also been attempted to manufacture glucose by grinding the corn and directly converting all the constituent parts of the grain; but this method has not been successful, as it gives impure and discoloured products. The object of this invention is to produce glucose from Indian corn, by removing the hulls, gluten and germs from the crude starch, without going to the extent of manufacturing refined starch, and consists in steeping the corn, then detaching the hulls and germs from the starchy portions of the kernels by whipping or beating without additional water, then separating the hulls and germs from the crude starch by sifting, and then acidulating the crude starch, and converting it into glucose under pressure.—A. W.

Improvements in the Manufacture of Hard Sugar. W. R. Lake. From F. O. Matthiessen, U.S.A. Eng. Pat. 9326, August 4, 1885.

This is a process for transforming soft sugar into hard sugar without increasing its density, the product being a comparatively light hard sugar, having but two smooth sides, the remaining four sides having the rough appearance produced by cleavage. A layer of soft sugar, or a mixture of granulated and soft sugar, spread upon the bottom of a horizontal pan, to the depth of, say $1\frac{1}{2}$ of an inch, is subjected to pressure so as to reduce the thickness of the layer by from $\frac{1}{32}$ to $\frac{1}{16}$ of an inch. The extent of pressure required at this stage of the operation will vary, according to the percentage of moisture in the sugar. The more moist the sugar the less will be the pressure required. The compressed sugar is then subjected to a moderate heat for, say, six hours, whereby it is transformed into a cake of hard sugar, which is divided into cubes or blocks, by cleaving it in parallel lines both lengthwise and crosswise.—A. W.

XVI.—BREWING, WINES, SPIRITS, Etc.

Recent Work in Brewing. Dingl. Polyt. J. **256**, 456.

The following abstracts are from papers which appear in the Proceedings of the third general meeting of the Berlin Union for Brewing Research and Teaching:—

The Influence of Hops upon the Keeping Properties of Beer. M. Hayduck.

Hops exert a two-fold influence upon the durability of beer. They check the growth of disease ferments, and also precipitate the greater part of the albuminous matter of the wort by means of the tannin which they contain. Hops also somewhat improve the yeast fermentation. The author has made experiments upon the retarding influence of hops, bacterial growth, especially the lactic acid ferment. He finds that malt mashed at 62°, and fermented at about 50°, gives a pure lactic acid fermentation, no volatile acid being formed. When, however, he ferments with addition of an aqueous extract of hops, the growth of bacteria is stopped, and a pure alcoholic fermentation takes place. The same antiseptic effect is produced by the extract from 2grms. hops per litre of wort, as by the extract from 30grms. per litre, and even $\frac{1}{2}$grm. per litre produces a marked effect. The author endeavoured to isolate the antiseptic substance, and concludes that the action is due to the bitter hop-resin, hop-oil and hop-tannin being without action. He finds that there is a marked difference in the antiseptic action of different kinds of hops, and that the efficacy decreased with age. Hops which had been once extracted, gave, on second and third treatments, liquids as strong in antiseptic power as the first extract. Addition of hops does not prevent acetic fermentation; in fact, the fermentation appeared to be more active in the presence of hops. Butyric acid fermentation appeared to be stopped by addition of hops; but the author is still working at the subject, and promises early results.

Deinhardt, continuing his researches on "hopping," finds that beer from a high-dried malt, requires a much larger quantity of hops to produce the same effect, than beer from a low-dried malt. Also, that beer hopped to a strongly bitter flavour loses a large portion of the hop-bitter on keeping. He also determines the smallest and largest quantity of hops necessary to produce a given effect, and the influence of time of boiling with hops upon the flavour of beer.

Matz gave the results which he had obtained with two samples of pure yeast from the Carlsberg laboratory. The beer from sample No. 1 brightened very slowly, and required to be stored for some time; but it possessed great keeping properties. No. 2 brightened very quickly, but the beer would not stand long transport.

Francke discussed the question whether the breaking of beer was dependent upon the condition of the barley. He ascribes a bad breaking to a deficient supply of yeast food, and concludes that it is necessary for the malt to be stored for six or eight weeks before it is used, since an undoubted molecular change goes on slowly in the stored grain. He also remarks that last year's malt was deficient in diastatic power.

Reinicke has experimented upon washing steeped and dry barley. He recommends that barley should be washed after steeping, to remove injurious matter, and also to remove the smell of the steeping water. He states that the difference in washed and unwashed barley can be detected by the smell of the grain on the floors during the malting process. Experiments showed that washing dry barley was ineffectual for removing the dirt particles.

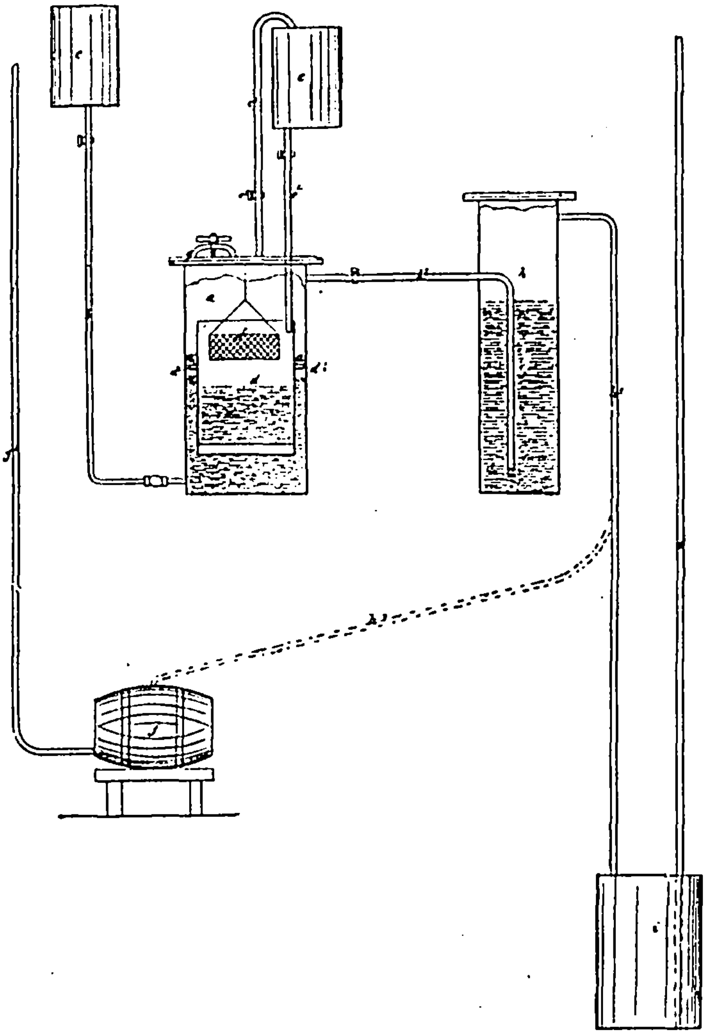
Delbrück ascribes the reddening of white beer to a round bacterium, resembling sarcina. He thinks it possible to find hops which will exert an antiseptic action upon this ferment.

Delbrück concludes that the grounds for judging a water for brewing purposes are still uncertain. An apparently bad water may yield a good sound beer; and the only sure guide is to make a brewing with the water in question.

Noback states that the "steep" water determines the character of the beer, that it is impossible to brew a Pilsen beer with Munich water, and *vice versâ*—the inorganic constituents of the water determining the character of the beer, and that the three types of beer—Pilsen, Vienna, and Munich—can only be obtained with the respective waters. On the other hand, Gregory maintains that the different types may be obtained with the same water.—G. H. M.

Improvements in Apparatus for Producing Carbonic Acid Gas and for Utilising the same in Raising Malt Liquors, and for other Analogous Purposes. C. R. Bonne, Manchester. Eng. Pat. 6821, June 4, 1885.

The apparatus described is self-regulating in pressure and quantity of the gas produced, and hence specially suitable for raising malt liquors. An enclosed vessel *a* is supplied with water from the cistern *c* overhead. Floating upon the water in *a* is an open-topped float *d*, made of any acid-resisting material, the buoyancy of which is increased by forming the bottom hollow. The float receives a supply of acid from the acid cistern *c*, the pressure being ensured by the upper part of the cistern being connected with the generator *a*.



Suspended from the top of *a* is a perforated cage *j* containing the carbonate required. Upon starting the apparatus, water is admitted into the generator from the cistern *c*. This causes the float to rise until the flange *d'* comes into contact with a corresponding flange *a'*, thus closing the communication between the upper and lower part of *a*. Simultaneously the acid comes in contact with the carbonate, liberating carbonic dioxide, which accumulates in *a*, and forces the water back into the cistern *c*. By this means the float *d* is lowered at the same time, and the acid not being in contact with the carbonate, the supply of gas is stopped until by reason of the gas being consumed the pressure is once more reduced; the water level is raised again, and the same operation is repeated. In order to raise a malt liquor by this machine, the latter is connected with the tank, cask, etc., by a pipe, so that the gas, after being washed in *h*, can exercise a pressure on the surface, and so cause the liquor to rise to the desired level. The degree of pressure depends upon the head of water in the cistern *c*. If it be required to work at a higher pressure, the pipe *b* is divided into two branches, one fitted with a back pressure valve to permit the water to flow from the cistern *c* only, but not to return thither, and the other branch provided with a weighted valve, which only opens when a certain pressure is reached.—S. H.

Acidity of Beer. A. Bertschinger. Dingl. Polyt. J. **256**, 519.

Acidity of beer is best estimated by adding 10cc. free from carbonic acid, to a decinormal solution of soda, and, after the addition of litmus, titrating by means of decinormal sulphuric acid. Swiss beer contains from 0·12 to 0·22 per cent. free acid, reckoned as lactic acid. —J. T.

Vent Peg adapted for Purifying the Air admitted to Fermentable Liquids. William Henry Hall. Eng. Pat. 13,201, October 4, 1884.

This is an arrangement by which the air admitted through the vent to a cask or other closed vessel containing beer, etc., is made to pass through some filtering material, such as water, solution of salicylic acid or flannel, in order to remove from it impurities likely to decompose the beer.—G. H. M.

Improvements in or relating to the Treatment of Maize in the Manufacture of Spirits. William R. Lake. From William Thomas Jebb, New York. Eng. Pat. 4957, April 21, 1885.

This patent refers to the separation from maize of a starch meal free from the hulls and germs of the corns. The separation is effected by steeping the corn in warm water (about 140°) for some hours, until the kernels become swelled; the water is then drained off, and the steeped maize introduced into a machine in which it is thoroughly beaten or whipped. This reduces the starchy matter to powder, without breaking up the hulls and germs. In this way the corns are divided into three distinct products—the finely-granulated starchy portions, the germs which are considerably larger than the granules, and the still larger hulls. The three bodies are then separated by sifting, and the pure starchy bodies may be mashed and fermented. The author claims that the liberation of fusel-oil, etc., is avoided by getting rid of the germs and hulls; that the conversion of the starch is effected more uniformly; that the fermentation is more under control; that the distillation of the spirit can be carried on at a lower temperature and with less loss of spirit; and that a better quality of spirits is produced. The hulls and germs may be used for fodder, or may be used for the preparation of oil-cakes. Drawings of the plant required are given, including a tank for developing the starch under pressure.—G. H. M.

Improvements in the Manufacture of Beer. Philip M. Justice. From Andrew W. Billings, New York. Eng. Pat. 9847, August 19, 1885.

A certain percentage of raw grain is to be added, in the manufacture of beer or ale, whereby the quantity of malt required is reduced, a superior beer produced, and a great saving in labour and expense effected. These results are obtained by making two mashes, one of malt in the ordinary manner, and the other a supplementary mash of Indian corn, rice, or other raw grain. The grain for the latter mash is ground, mixed with the requisite quantity of water at 112° F. in a special form of mashing apparatus, and the mixture then heated to about 210° F. by the injection of live steam. The pasty mash so obtained is then quickly cooled to 140° by the injection of cold water, and sufficient ground malt is added to saccharify the starch. At the end of about two hours live steam is again injected, and the temperature raised to about 185°; the mash is then allowed to cool and run into the mash prepared from malt in the usual way. The subsequent operations are carried on as in an ordinary brewing. The author claims for his method complete conversion, largest yield of extract, and no extraction of oils, avoiding thereby any corn-like flavour or smell. The details of the process may be varied in several respects. A full illustrated description of the apparatus used is given. —G. H. M.

XVII.—CHEMISTRY OF FOODS, SANITARY CHEMISTRY, DISINFECTANTS, Etc.

(*A*) CHEMISTRY OF FOODS.

Improved Process of Preserving Smoked Fish. O. Syllwasschy, Ellerbeck. Eng. Pat. 12,929, September 29, 1884.

The fish are first smoked and then pickled, after which they are packed in barrels. Prior to use, and after removal from the barrels, they are washed to remove the salt, and again smoked. It is claimed that after treatment by this method the fish can be kept longer and without injuring the flavour, even of the most delicate varieties.—C. C. H.

Improvements in the Preparation of Caseine, etc. A. M. Clark, London. From E. E. Childs, Brooklyn. Eng. Pat. 14,240, October 28, 1884.

Unsuited for abstracting.—C. C. H.

Process of Treating Fish Roe, etc. E. E. Waters, New York. Eng. Pat. 7016, June 9, 1885.

The roes are first washed to remove the blood, salt, etc.; they are then split and macerated for twenty-four hours in an aqueous solution of ammonia containing from two to five per cent. of concentrated ammonia. After straining, the solution is either evaporated or the albumen precipitated by the addition of an acid, pressed and dried. In the latter case it is desirable to moisten the cake in a solution of ammonia before drying to gelatinise the exterior. Caustic potash or soda may be used in place of ammonia.—C. C. H.

(*B*) SANITARY CHEMISTRY.

Report on the Waters of the Hudson River. C. F. Chandler, Ph.D.

This investigation was undertaken by the author at the request of the Water Commissioners of the City of Albany. Its object was to determine whether the water of the Hudson River, the source of the supply of the city, was in any way rendered unfit for consumption by the reception of the sewage discharge of the cities situated above the intake, notably Troy, with a population of 60,000. Analysis by Wanklyn's method failed to show any considerable quantity of nitrogenous matter indicative of sewage pollution; indeed, the water supplied to Albany contained less albumenoid ammonia, after it had received the sewage of Troy, than the water from the river above Troy at a place where it is practically free from any considerable pollution. Biological examination the author considers in this case to yield a negative result, because fermentation experiments did not appear to develop any organisms which were not developed by water absolutely free from sewage pollution. With respect to the transmission of disease by a water which although polluted has by oxidation undergone purification, after reviewing the opinions of Huxley, Tidy, Letheby, Angus

Smith, Magnen, and others, he concludes that it does not appear to rest on any substantial basis that diseases have ever been transmitted by a water which would not have been condemned by the ordinary methods of analysis. Koch's theory he views in a similar light, and does not consider it fairly established. In conclusion, notwithstanding the pollution of the Hudson by the sewage discharge of the city of Troy, Professor Chandler maintains that dilution combined with oxidation effectually removes all evils which might accrue from the pollution. After comparison with the water supply of European cities, and a comparison of the death-rate of the leading American cities, he sees no reason why the source of supply should not be considered a good one, and views the objections raised as more sentimental than sound.—C. C. H.

Tarred Water Pipes. W. Thörner. Chem. Zeit. 1885, 926.

TARRED water pipes frequently contaminate the water if the tarring is not properly done. It is best, where practicable, to dip the pipes, when sufficiently cool after casting, in a liquid which wets them easily (alcohol, petroleum, crude benzene, toluene, etc.). The liquid thus used must mix readily with tar and easily evaporate. After moistening, the pipe is tarred by immersion.
—J. T.

Improvements in the Preparation of Agents to be used in the Treatment of Sewage, etc., and in the Treatment of such Matters. J. W. Slater, London. Eng. Pat. 12,830, September 26, 1884.

(1.) PEAT is mixed with water and ground to a thin mixture. (2.) Iron slags or slag wool are treated with hydrochloric acid, sufficient to convert the whole of the alumina into chloride, and leave a slight excess of acid. The sewage is treated by adding from twenty to thirty parts of mixture (1) to 10,000 parts of sewage, and subsequently with six to eight parts of mixture (2). The organic matters in solution and suspension are precipitated and allowed to subside. The quantity of clay used in (1) depends on the temperature of the sewage—ordinarily from twenty-five to thirty per cent. of the weight of the solid matter in the peat, and the lower the temperature the less the quantity required. The slag should be free from oxides of iron, lime, magnesia, and alkalis. Chloride of copper may be used to oxidise the iron salts present. If more than thirty grains of organic matter per gallon of sewage is present, larger proportions than above specified are used. The claims are: (1.) The treatment of sewage by the mixture of peat and clay; (2.) The treatment by the subsequent addition of the solution of the slags in hydrochloric acid.—C. C. H.

Improvements in Filters; a Device for Cleansing the Filtering Bodies of the same. C. E. Chamberland, Paris. Eng. Pat. 6646, June 2, 1885.

THE author in a previous patent described the construction of a filter which removes the suspended matter from water and also the microbes and germs. This consists of a cylinder of fine porcelain through which the water is forced from the exterior to the interior. In operating upon a large quantity several of these are placed in a closed vessel; for removing the deposited matters from the surface of the cylinders the device described in this specification is intended. Two plates which have holes encircling the filtering cylinders are bolted together and nip between them canvas, rubber, or asbestos, so as to fit tightly against the exterior of the porcelain cylinders. A central screw forces the plates from end to end of the containing vessel, and thus scrubs off the solid matter from the cylinders. Steam may also be used for regenerating the porcelain.—C. C. H.

Improved Process for the Economical Production of a Porous Carbon, etc. G. E. Ellis, Newton Abbot. Eng. Pat. 7318, June 16, 1885.

THE material used is the carbonaceous clay deposit found above the Devonshire lignite beds; the open face deposits are preferred. After a preliminary drying the clay is pulverised and incorporated with ten to fifteen per cent. of lignite, fifteen to twenty-five per cent. of aluminious schist, one to two per cent. of coal-tar or pitch, and is then formed into blocks in a brick press. After drying, the bricks are heated in retorts and finally granulated.—C. C. H.

XVIII.—ELECTRO-CHEMISTRY.

Improvements in Secondary Batteries. Alexander Henry Reed, Middlesex. Eng. Pat. 14,508, November 3, 1884.

BY this invention a secondary battery is constructed, instead of with lead, with zinc in an alkaline solution, and not, as is usual, in an acid solution. Consequently the oxide of zinc on dissolution in the potash or soda, or any other metallic oxide soluble in alkalis, is employed in the construction of the pile, the positive pole of which is constituted by hydrates of oxides or anhydrous oxides insoluble in potash or soda as depolarisers.—T.

Improvements in the Manufacture of Carbons for Incandescent Electric Lamps. Mortimer Evans and Frank Wynne, Lambeth, London. Eng. Pat. 12,675, September 22, 1884.

THIS invention has regard to material from which carbon filaments may be produced, and to the treatment of this, and consists in first obtaining a substance of a homogeneous nature, composed of a substance which may be carbonised, and treating it in such a way as to form filaments or threads of uniform sectional area and quality.—T.

Improvements in the Construction and Application of Carbon or Carbonaceous Electrodes for Primary and Secondary Elements. Richard Heber Radford, Sheffield, Yorkshire. From Hermann Friedrich Bouté Schaefer, Berlin.

IN order to form electrodes of carbon, or carbonaceous material in large sizes, a hose (*i.e.*, a flexible tubular case or envelope) is filled, during its production by the machine, with small particles of carbon or carbonaceous material, and pressed in firmly, and in such a manner that the production of the hose progresses in the same ratio as it is filled.—T.

XIX.—PAPER, PASTEBOARD, Etc.

An Improved Cold Process for the Manufacture of Paper Pulps and Bleached or Unbleached Textile Fibres, and Apparatus therefor. Hippolyte Vessier and Amédée Wilbaux. Eng. Pat. 14,859, Nov. 11, 1884.

THE process consists in treating the material, such as straw, esparto, flax, cotton, old papers, wood, rags, etc., with a cold solution of caustic soda, varying in strength from 10° to 25° B. After steeping in this bath for one to eight hours, according to the nature of the material, it is washed in a special apparatus, a drawing of which is given, and bleached with a solution of bleaching powder and salt, in the proportion of one part of the former to seven parts of the latter.—E. J. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Work of the Pharmaceutical Commission. Arch. Pharm. (1885), **23**, 466, 497.

THE work of the commission begins with the publication of elaborated articles on the Pharmacopœia, and from it statements of general interest are selected.

Vinegar.—Concerning the colour an alteration is made therein, that the vinegar must be colourless or feebly yellow, whilst the Pharmacopœia allows a yellow colour. The residue on evaporation must not exceed 0·5% against the former exceedingly high 1·5%.

Borax.—The former statement of the special reaction, "The aqueous solution turns turmeric paper brown on the addition of hydrochloric acid," is amended by the following: "The aqueous solution reacts alkaline; it turns turmeric paper brownish-red after some time, even after acidification by hydrochloric acid."

Bromine.—The statement concerning the solubility in water is affirmed in that it dissolves in 30 parts of water at 15°. The estimation of the solubility in sodium hydrate is extended in that this solution must separate no oily droplets, nor give out a smell like chloroform, which would indicate the presence of bromoform. A rough test for the amount of chlorine is given, which allows about 3% to pass. 1cc. of the bromine solution (1 in 30) is diluted with 9cc. water, and a small excess of ammonium carbonate and silver nitrate is added and well-shaken up. After filtration the filtrate, on the addition of nitric acid, must not show more than an opalescence.

Extracts.—In testing for copper, the acidified solution is to be heated to boiling, and then cooled before testing with an iron rod.

Soda-ley.—Traces of alumina are allowed. Diluted with 15 parts of water and acidified with acetic acid, the addition of barium nitrate or of silver nitrate and nitric acid must not produce more than opalescence. This test excludes 0·15% chlorine and 0·3% sulphuric acid.

Opium.—The following directions are given for testing this much-discussed subject of research, and the minimum quantity of morphia is put at 10%: 8grms. powdered opium are placed on a filter of 80mm. diameter, and are gradually washed with 18grms. of ether, the funnel being kept covered. The opium is then dried in a water bath and shaken in a flask with 80grms. water at 15°. After standing half-a-day, 42·5grms. of this aqueous opium extract are filtered off into a flask, 12grms. alcohol, 10grms. ether and 1grm. ammonia being added, and the mixture is kept in a closed vessel with frequent shaking for 12 hours at a temperature of 10° to 15° A weighed filter of 80mm. diameter is then moistened with ether, and the ethereal layer from the flask is poured on it, and afterwards the whole contents of the flask, after shaking with 10grms. more of ether, are placed on the filter. The morphia crystals are then washed with a mixture of 2grms. dilute alcohol and 2grms. ether, and are weighed after a final drying at 100°. The weight must not be less than 0·4grm.

Tinctures.—The preparation is to consist of maceration for eight days in a well-closed flask in a shady place. Recourse to digestion is abandoned, because the much simpler maceration gives much more durable and quite as strong a tincture.

Wood Vinegar.—Testing for hydrochloric acid is added.

Chloride of Lime.—This must contain at least 20% of available chlorine.

Water-Glass.—The testing is extended to the estimation of caustic or carbonated alkali, because the presence of these renders it unsuitable for bandages. The following test is given: If equal parts of water-glass and spirits of wine are triturated together in a basin, a granular salt (tri- or tetrasilicate) must separate, and not a pappy (monosilicate) or greasy salt (bisilicate), and the filtered solution must not turn turmeric paper brown.

Liquid Paraffin.—A paraffin of at least ·880 sp. gr. is required, whilst the present pharmacopœia only specifies ·840 sp. gr. It must not boil below 360°. As a test of purity for the liquid, as well as for the solid paraffin, the following is given: 3grms. paraffin heated with 3cc. H_2SO_4 in the water-bath, with frequent stirring for 15 minutes, must not produce a change in the paraffin, and the sulphuric acid must only be slightly coloured brown.

—G. H. B.

Cod-liver Oil and Iron. Pharm. Zeit. **30**, 507.

For the preparation of this drug, ferric benzoate is the most suitable. 60grms. toluenobenzoic acid dissolved in 300cc. boiling water are treated with 102grms. ammonia solution (10%). To this solution is added a mixture of 100grms. ferric chloride solution (10% Fe.) and 300cc. water, and the precipitate is washed on a filter until free from chlorine; it is then pressed and dried. 20grms. of this ferric benzoate, together with 5grms. toluolbenzoic acid, are rubbed together with some cod-liver oil and then digested with 1kilo. cod-liver oil on the water-bath, with stirring for one hour. The cod-liver oil and iron thus prepared is filtered whilst warm; it contains 2% ferric benzoate, or 0·3% Fe., has a good taste, and owing to the free benzoic acid it keeps well.—G. H. B.

Compounds of the Alkaloids with Iodine Chloride. M. Dittmar. Ber. **18**, 1612.

A general reaction for pyridine and quinoline, and their alkaloid and other derivatives, consists in their combination with chloride of iodine to form very characteristic addition products containing one ClI for each pyridine-ring.

Thus, if X be an alkaloid containing one pyridine-nucleus, it will form a compound of the formula XICl, and if Y contain two pyridine-rings it will form a compound YI_2Cl_2.

These bodies are, for the most part, sparingly soluble yellow precipitates, which are produced by adding to a solution of the alkaloid a solution of iodine chloride in HCl, or a mixture of KI, KNO_2 and HCl (the latter solution is not always suitable). With an excess of chlorine they can form unstable compounds of the formula $XICl_3$ corresponding to iodine trichloride. They are readily attacked by NaOH and by NH_3, and with the latter they form compounds of the constitution $XINH_2$; these are dull-green or dull-red unstable bodies, insoluble in water, converted back into the chloriodides by HCl, and decomposed on boiling with alcohol according to the equation—

$$6XINH_2 = 3X + 3XNI_2 + 4NH_3 + N_2,$$

thus evolving one-third of their nitrogen.

These iodoammonia compounds are also produced by the combination of the alkaloid with iodide of nitrogen (NH_2I). The author is inclined to consider that the latter bodies are molecular compounds of the base with iodide of nitrogen, and that the chloriodides are molecular compounds of the base with ICl.

The hydroxyquinolines in which the OH group occurs in the benzene-ring, and tetrahydroquinoline and its derivatives do not combine directly with chloride of iodine, and are thus exceptions to the general rule.

The following are the reactions of some of the alkaloids and derivatives of quinoline towards this reagent:—

Theobromine and *Caffeïne*—No effect, since they are not derivatives of pyridine or quinoline.

Morphine—Separates iodine.

Quinoïdine—Light-brown amorphous ppt.

Quinine—Light-brown crystalline ppt.—

$$(C_{20}H_{24}N_2O_2I_2Cl_2)$$

Quinidine.—Light-yellow ppt. scarcely soluble in HCl.

Cinchonine—Light-yellow ppt.

Brucine—Light flocculent ppt.

Strychnine—Yellow ppt., soluble in HCl.

Papaverine—Yellow flocculent ppt., slightly soluble in HCl.

Codeïne—Ppt. soluble in HCl.

Thebaïne—Whitish ppt.

Narceïne—Greenish-yellow ppt., soluble on heating, and reprecipitated as light-yellow needles.

Piperine, piperidine, aconitine, veratrine, narcotine, thebaïne, codeïne, and conceïne—Yellow ppts.

Cocaïne—Light-brown crystalline ppt.

Nicotine and *Atropine*—Yellow ppts. which dissolve on heating and reprecipitate as compact brown crystals.

Pyrrol—Black insoluble body (C_4H_5NICl).

p-Toluquinoline—Easily soluble reddish-yellow needles, $C_{10}H_9NICl,HCl$; melting point 112°, blackened by NH_3.

β-Naphthoquinoline—Light-yellow needles—

$$C_{13}H_9NICl,HCl;$$

melting point 148°, soluble in HCl, blackened by NH_3

Antipyrine—Light-yellow needles, $C_{11}H_{11}ION_2ICl$; melting point 142°, soluble in alcohol, blackened by NH_3.

Hydroxymethylquinoline—Yellow needles, soluble in alcohol, blackened by NH_3.

Quinaldine—Yellow needles, melting point 151°.

Diquinoline—Light-yellow ppt.—

$$C_{18}H_{12}N_2I_2Cl_2,H_2Cl_2:$$

insoluble in alcohol.—A. G. G.

Reaction between Brucine and Strychnine. A. Hanssen. Ber. **18**, 1917.

THE author has submitted brucine and strychnine to a similar process of oxidation with chromic and sulphuric acids. The resulting product is the same in both cases, and has the formula $C_{16}H_{18}N_2O_4$. It appears, therefore, that in the case of strychnine, the group C_5H_4, in that of brucine the group $C_7H_8O_2$, have been eliminated. The author explains this by supposing that the group C_5H_4 represents a benzene ring, joined to the group $C_{16}H_{18}N_2O_4$, as in "diphenyl." The explanation is borne out by the fact that strychnine forms nitro- and bromo-substitution products, which is not the case with the oxidation product. In the same manner the group $C_7H_6O_2$, split off by oxidation from brucine, is supposed to be a dimethoxy-benzene group, and brucine a dimethoxy-strychnine.—J. B. C.

Action of Caustic Alkalis on Cinchonine and other Cinchona Alkaloids. A. Krakau. Ber. **18**, 1934.

THE action of caustic alkalis was effected at a temperature of about 200°, in a current of superheated steam. By modifying the usual method in this way, the author obtained quinoline, lepidine, a solid substance remaining in the residue, and a thick oil which distilled with the other bases. The separation of the quinoline bases from this product was effected by steam. From cinchonidine, quinine and quinidine, similar products were obtained by the same method.—J. B. C.

Aseptol (Orthophenylsulphonic Acid). E. Serrant. Compt. Rend. **100**, 1465.

THIS compound is said to possess greater antiseptic properties than phenol, and its action is less injurious than that of phenol.—D. B.

Kolbe's Synthesis of Salicylic Acid. R. Schmitt. J. Prakt. Chem. 31, 397.

FROM the transformation of potassium phenylsulphate into potassium paraphenylsulphate, Baumann (*Ber.* 11, 1910) supposed that in the preparation of salicylic acid sodium phenylcarboxylate was at first formed, and was subsequently converted into sodium salicylate. This hypothesis is confirmed by Hentschel (*Ber.* 16, 795), who showed that in the presence of another molecule of sodium phenol, sodium phenyl-carboxylate is decomposed with the formation of disodium salicylate. In the present paper it is shown that by the absorption of carbon dioxide sodium phenol is readily converted into sodium phenyl-carboxylate, which, on heating, is completely transformed into the isomeric sodium salicylate. When sodium phenyl-carboxylate is heated with one molecule of sodium phenol, disodium salicylate and free phenol are obtained.
—D. B.

Study of the Alkaloids. O. de Coninck. Bull. Soc. Chim. **43**, 236—247.

(3.) *Quinoline bases*, as observed by Williams, are polymerised by sodium; their chloroplatinates, as mentioned (*Ber.* 16, 2082), are not decomposed by boiling with water. Carbon disulphide acts very slightly on quinoline, a very small quantity of transparent crystals being produced after two or three days.

(4.) *Conine.*—Carbon disulphide readily acts on this base, producing, without evolution of sulphuretted hydrogen, a thick, yellow-brown, unpleasantly-smelling fluid. The chloroplatinate of pure conine is incompletely decomposed by boiling water, whilst the double platinum salt of commercial conine (containing methylconine) undergoes complete decomposition; the two phases of Anderson's reaction, however, do not occur. On dissolving the platinum salt of the impure base a red oil separates, which is only taken up by water on warming, and solidifies in the cold to a resinous mass.

(5.) *Nicotine.*—Carbon disulphide has no action, and the chloroplatinate is not decomposed by boiling water. The base, as shown by Etard, is oxidised by mercuric oxide, whilst β-lutidine (from brucine) and α-collidine (from cinchonine) are not attacked by this reagent.

The author compares the properties and behaviour towards chemical reagents of the pyridine bases, the alkaloids, and the quinoline bases, and adds some observations on the resinous masses obtained by the distillation of the ammonium iodides of the pyridine bases with potassium hydroxide. He further remarks that, in addition to the suffocating odour occurring in this process (Hofmann, *Ber.* 14, 1497), a red colouring matter is produced, readily recognisable on treating the product of the reaction with acidified water. The colour and the odour together serve as a test for small quantities of pyridine bases. At the conclusion of the foregoing work, the author mentions the action of sodium on piperidine, conine, and nicotine. Piperidine does not appear to be polymerised by this metal, either in the cold or at high temperatures. Commercial conine is converted into a yellow crystalline substance readily soluble in, but not decomposed by, water. Pure conine is likewise converted by sodium into a crystalline compound, from which conine is regenerated by the action of water. This difference in behaviour might serve to distinguish pure from impure conine. Nicotine submitted to the action of sodium produces, after many weeks, a solid substance, which, by contact with water, reproduces an oil having the character of nicotine.—F. L. T.

Sodium Orthovanadates and Analogous Salts. Harry Baker. J. Chem. Soc. 1885, 353.

RAMMELSBERG (*Ber.* 15, 1674) and Mendelejeff previously questioned whether the phosphates should be considered as allied to the vanadates. After Ditte (*Ber.* 18, Ref. 4) had shown that vanadium could replace phosphorus in the Apatite and Wagnerite groups, the author sought to establish the same point by the study of the orthovanadates. (1.) *Sodium orthovanadate*, $Na_3VO_4,12H_2O$.—Hitherto the only known salt was that with $16H_2O$, described by Roscoe. By fusing vanadic acid with sodium carbonate, and treating the aqueous extract of the melt with caustic soda, the vanadate crystallises in longer or shorter hexagonal prisms with basic terminations (the rhombohedron being occasionally indicated) quite analogous to the orthophosphate and arsenate. A crystal of the vanadate continues to grow in a solution of the phosphate, and a small crystal of any of the three salts causes crystallisation of supersaturated solutions of the others. In the preparation of the salt described, three other salts were obtained from the alkaline mother-liquor. (2.) *Sodium orthovanadate*, $Na_3VO_4,10H_2O$, in two modifications, the one crystallising in well-defined, clear rhombic dodecahedra, the other in thin hexagonal plates, $\infty P.0P$. (3.) $Na_3VO_4,8H_2O$ (?) occurs in rhombic plates. The salt can only be isolated by the mother-liquor being carefully decanted and the crystals repeatedly washed with alcohol diluted so that no precipitation occurs. The phosphates and arsenates corresponding to the last three vanadates have already been observed by the author, but not as yet prepared in any quantity. (4.) *Sodium fluovanadate*, $2Na_3VO_4,NaF,19H_2O$, is obtained either by fusing together of the corresponding amounts of vanadic acid, sodium carbonate, and sodium fluoride, and crystallising from a warm aqueous solution, or by adding the calculated quantity of sodium fluoride to a saturated solution of sodium orthovanadate, or pyrovanadate with excess of caustic soda. The salt forms clear regular octohedra, which can be recrystallised from dilute caustic soda solution. The corresponding sodium fluophosphate has been frequently described, lastly by Rammelsberg (*Ber.* 14, 689). Sodium fluoarsenate, $2Na_3AsO_4,NaF,19H_2O$, forms shining isotropic octohedra. The author also examined the indices of refraction of the salts described.—F. L. T.

XXI.—EXPLOSIVES, MATCHES, Etc.

Magnesium for Bengal Lights. Dingl. Polyt. J. **256**, 518.

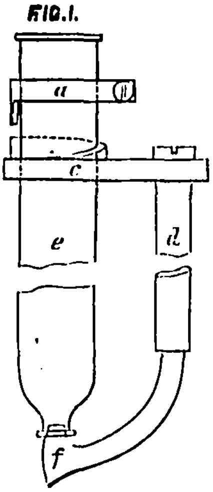
THE chemical firm late E. Schering, in a circular, recommends the following mixtures:—For white fire, 1 part shellac, fused with 6 parts barium nitrate, ground and mixed with 2·5 per cent. of magnesium powder. For red fire, 1 part shellac, 5 parts strontium nitrate, fused together, ground, and mixed with 2·5 per cent. of magnesium powder. These mixtures can be made into ribbons about a finger's breadth, or they may be charged into thin zinc tubes so as to make magnesium torches. On burning, the zinc case burns with its contents.—J. T.

XXII.—GENERAL ANALYTICAL CHEMISTRY.

Apparatus for Volumetric Analysis. Dingl. Polyt. J. **256**, 502—503.

J. Greiner describes the burette shown in Fig. 1. A brass rod *d*, carried by a suitable stand, has its bottom end formed into a stopper *f*, whilst at its upper end is an arm *c*, encircling the burette and forming a screw surface. Affixed to the tube is a ring *a*, bearing a tooth *b*, Fig. 2. In using the burette the ring *a* is so fixed that the tube rests air-tight on the stopper *f*. On turning the tube the tooth *b* slides up the screw path *c*, by which the tube is raised from *f*, and its contents can escape.

FIG. 1.



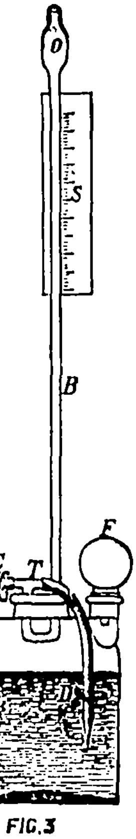


FIG. 3

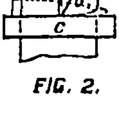
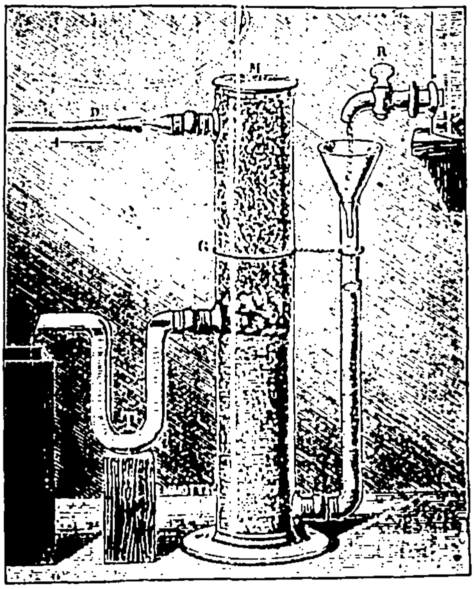


FIG. 2.

K. Bourdon describes a burette arrangement which requires no stand. One neck of a three-necked bottle contains a dipping tube V, Fig. 3; the second neck contains a T-tube T, which connects V, the burette B, and the jet D. On compressing the indiarubber ball F, placed in the third neck, closing the clamp D, and opening the clamp C, the burette B is filled with acid. The scale S is so placed that its zero point coincides with the top of the liquid column.—J. T.

New Laboratory Apparatus for the Continuous Production of Gas. M. Gaston Tissandier. Bull. de la Soc. Chim. de Paris, March 5, 1885.

THE forms of apparatus usually employed for the preparation of hydrogen, carbonic acid and sulphuretted hydrogen, have this serious disadvantage—viz., that the rate of production of the gas gradually diminishes as the acid employed becomes saturated with the particular salt formed. The object the author had in view in devising the present form of apparatus was to overcome this difficulty, and to enable him to command the production of a steady stream of gas. The apparatus consists of a glass vessel, furnished with three tubulures. It is filled with the material to be acted upon from the top M, which is then covered with some impervious material. The acid, suitably diluted with water, is contained in a reservoir, and flows through the cock R, by way of the side tube A, thus entering the apparatus from below. After acting upon the material contained in the lower part of the apparatus, the acid passes away by the U-tube T. The gas generated escapes through the tube D, attached to the upper tubulure. As the material in contact with the acid becomes dissolved, its place is supplied from above. In this way a constant supply, both of fresh acid and fresh material, is maintained, and the rate of production of gas is kept perfectly constant. The rate can be regulated by controlling the flow of fresh acid by means of the cock R.—E. J. B.

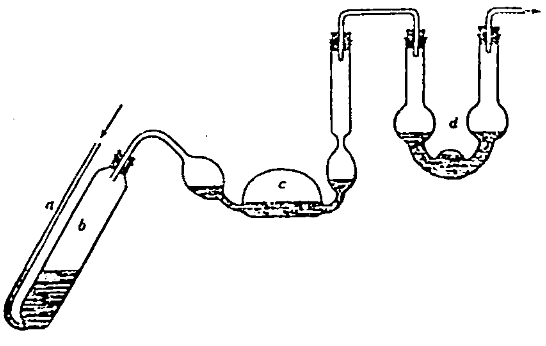


Estimation of the Halogens. G. Weiss. Rep. Anal. Chem. **5**, 238.

THE halogens must be in the state of hydracids; salts of ammonium should be avoided, and the solutions should be neutral. The tubes *c* and *d* are filled with solution of iodide of potassium; the solution or substance is placed in *b*; a gentle stream of air is passed through from *a* to *e*. A slight excess of strong solution of neutral ferric sulphate is run into *b*, and the mixture slowly raised to the boiling point. The reaction which takes place is as follows:—

$$Fe_2(SO_4)_3 + 2KI = 2FeSO_4 + K_2SO_4 + 2I.$$

The iodine carried over by the steam and air is dissolved in the iodide of potassium, and determined by the usua method. No bromine is carried over if the solution be neutral. The residue in *b* is cooled, a slight excess of permanganate of potassium added, and the vessel again warmed in a water-bath to 50° to 60° C. The bromine vapour which is then evolved is drawn into and absorbed by dilute ammonia placed in *c* and *d*, and then either volumetrically or gravimetrically determined as silver bromide. In the final residue in *b* the chlorine may either be directly determined or calculated from a determination of the total halogens.—T. L. B.



Iron Analysis. O. Gmelin. Chem. Zeit. 1885, 925.

Sulphur Estimation.—The sulphur is determined, after evolving it as sulphuretted hydrogen, and passing this through two U-tubes furnished with bulbs, which contain permanganate solution. Some concentrated solution of sodium carbonate is introduced into the decomposing flask before the hydrochloric acid is added, so that the carbonic acid evolved may expel air.

Phosphorus Estimation.—The sulphuric acid solution freed from silica, is evaporated in a platinum dish, and the residue is gently ignited. After dissolving in hydrochloric acid, the phosphorus in the form of phosphoric acid is precipitated with ammonium molybdate solution, a final precipitation with magnesia mixture being made. —J. T.

The Volumetric Determination of Manganese in Alloys, Minerals, etc., by means of Potassium Chlorate. W. Hampe. Chem. Zeit. 9, 1083.

The method has been already described by the author two years ago, and the present paper describes the results of subsequent work, considerable space being given to discussion of the observations of other experimenters. A historical notice includes the names of Rammelsberg, Wächter, Hannay, E. Thomson, Ford, Kent, Troilius, Williams and Raymond. The process consists of the precipitation of manganese as hydrated peroxide from its solution in strong nitric acid, by the addition of potassium chlorate at a boiling temperature, and the titration of the peroxide by iron salt and permanganate. The solution must not contain sulphuric or hydrochloric acids, and where these occur their removal is effected by means of barium nitrate, or by boiling with nitric acid respectively. It is essential that the solution of the metals be in nitric acid, of sp. gr. 1·4, and if the acid be weaker than this it must be boiled down until heavy white fumes are evolved, when the necessary concentration is reached. A large excess of acid is without hindrance to the reaction. In the presence of acid of less sp. gr. than 1·4, a portion of the manganese escapes precipitation by forming permanganic acid. To describe the process shortly, the solution in strong nitric acid is heated to boiling in a flask, and potassium chlorate is dropped in, a crystal at a time, as long as green vapours are evolved; when the manganese has become completely precipitated, further addition of the chlorate produces only scarcely-perceptibly coloured vapours. Five minutes' boiling is necessary to complete the precipitation. Cold water is then added to the still warm solution, and this is then quickly filtered through a paper filter, and the precipitate is washed. The precipitate is then washed off the filter into a flask, acidified iron salt solution is added, which dissolves the precipitate, and the excess of iron salt is determined by titration with permanganate. The manganese peroxide obtained by this method has constantly the composition MnO_2, on which the standard solutions used are based. The observations of Ledebur, Kent, Mackintosh, Volhard, Pattinson and Wolff, on the reaction, are noticed. In the presence of cobalt lead and bismuth, the precipitate should be dissolved in nitric acid, and a little oxalic acid, and reprecipitated as before, in order to obtain exact results. Potassium bromate does not work so well as the chlorate. Where the percentage of manganese is small, as much as 20grms. or more of substance may be used without inconvenience. A series of results obtained in presence of other metals is given to show the exactitude attainable. The treatment most convenient in special cases, as for certain alloys and minerals, is described at length. The author considers this method to equal in exactness and universal application the phosphoric molybdic reaction.—G. H. B.

New Books.

Handbook of Technical Gas Analysis, containing Concise Instructions for carrying out Gas-Analytical Methods of proved utility. By Clemens Winkler, Ph.D., Professor of Chemistry at the Freiberg Mining Academy. Translated with a few additions by George Lunge, Ph.D., Professor of Technical Chemistry at the Federal Polytechnic School, Zurich. London: John Van Voorst, 1, Paternoster Row, 1885.

Large 8vo volume, bound in cloth, containing Translator's and Author's Prefaces, Table of Contents, Introduction, subject matter covering 122 pages, and an Alphabetical Index. The work is illustrated with 55 well-executed woodcuts. The subject matter is subdivided as follows:—Chapter I. On taking Samples of Gases. II. On the Measurement of Gases. III. Apparatus and Methods for carrying out the Analysis of Gases. (i.) Estimation of Gases by Absorption. (ii.) Estimation of Gases by Combustion. (iii.) Gas Analysis and Gas-volumetrical Analysis by means of Lunge's Nitrometer. An Appendix which completes the work, contains a series of useful Tables for Reference and Employment in the Calculations involved in the Analytical Operations.

The Art of Soap-making. A Practical Handbook of the Manufacture of Hard and Soft Soaps, Toilet Soaps, etc. Including many New Processes, and a Chapter on the Recovery of Glycerine from Waste Leys. By Alexander Watt. [Second Edition, carefully revised.] London: Crosby, Lockwood & Co., 7, Stationers' Hall Court, Ludgate Hill, 1885.

Octavo volume, bound in cloth, containing Preface, Table of Contents, and 228 pages of subject matter, followed by an Alphabetical Index. The work is illustrated by 36 woodcuts, and the Chapters are divided as follows:—Chap. I. Saponification Explained. II. The Soap Factory—its Apparatus and Appliances. III. Materials used in Soap-making. IV. Caustic Leys. V., VI. and VII. Manufacture of Hard Soaps. VIII. Making Soap by the Cold Process. IX. Oleic Acid—Soap from Recovered Grease. X. and XI. Cheapened Soaps. XII. Disinfecting Soap. XIII. Saponification under Pressure. XIV. Various Processes. XV. and XVI. Manufacture of Soft Soaps. XVII. Manufacture of Toilet or Fancy